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THE

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Volume

XX.

SHANGHAI:
THE FAR EASTERN REVIEW
1924

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PORT OF SABANG
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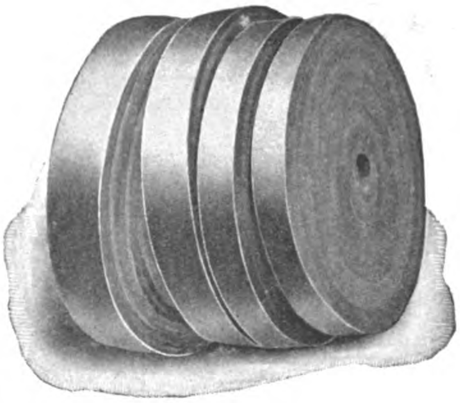

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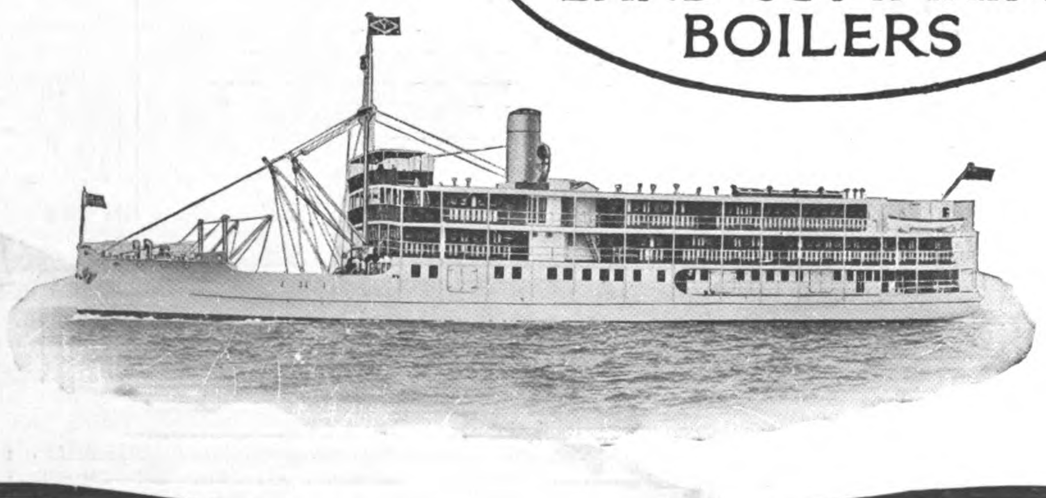

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When Is a Monopoly Not a Monopoly?

THE VAGARIES OF AMERICAN DIPLOMACY

The Radio Controversy

By Geo. Bronson Rea

BACK in the old Manchu days, somewhere about 1903, Prince Ching, then head of China's foreign relations wrote a note to Minister Conger in which he promised that in the event foreign capital became necessary to build the railway from Hankow into Szechuan, American and British financiers would be given the preference. At the same time, the British, French, Belgians and Russians were intrigueing at Peking to capture this particular concession and when the competition became keen and seemed likely to create international friction, the British group with the consent of its government, invited the others to pool their interests in a new company having for its object the creation of a monopoly of railway construction in the northern Yangtze valley. America could take no part in any combination with the odor of monopoly hanging round it, so our bankers ignored the invitation. The British, French and Belgians, however, came together in 1905 and organized the Chinese Central Railways, Ltd. Three years later, when the Szechuan railway was embraced in the British, French and German agreement to build the Canton-Hankow line, the American financiers demanded entrance into the combine, while President Taft sent a personal ultimatum to the prince regent stating that if the contract was signed without equal participation to the American group, he would consider it as an unfriendly act. We wouldn't have anything to do with a monopoly when invited by the British to participate but as soon as the others went ahead and had the agreement all ready for signing with the Chinese, we raised the issue of the "open door," equal opportunity and recognition of preferential rights, forcing our way theatrically into the very monopoly we would have nothing to with a few years previous.

In 1914, the Chinese government organized in Paris an international company for the financing, construction and operation of 10,000 miles of essential trunk railways, in which American, British, French and German interests held equal shares. This was an honest effort on the part of China to eliminate spheres of interest and put an end to the interminable squabbling over railway concessions by establishing the principle of international co-operation on a large scale. Each participant was to finance, build and equip 2,500 miles of lines. The American state department, however, in one of its inexplicable moods, declined to support the American participant, qualifying the contract as a monopoly ; a violation of the treaties.

Two years later, an American firm supported by its minister at Peking, signed an agreement with the Chinese government for the financing and construction of several lines of new railways aggregating 3,000 miles in length, all of which conflicted with compromises previously entered into by China with other powers. We would not enter the door that was held open for us in 1914, in order to abolish competition, but two years later again theatrically raised the issue of our right to ignore China's committments with other powers. This contract for 3,000 miles, however, did not constitute a monopoly, although by reason of its dominating position in the American investment market, the corporation which took over the contract, could make it almost impossible for any independent concern to enter the field in competition. Two years later, finding the door hermetically sealed against further American railway operations in China, the state department initiated negotiations for the creation of a new consortium, another monopoly in fact, to do the very thing it had declared illegal and contrary to the treaties in 1914. What was denounced as a monopoly in 1914 became a highly desirable contract in 1916 and the principle was adopted as the basis of our diplomacy in 1918 in the formation of the present consortium.

In the meantime, China entered into other important contracts, one with a British concern for the erection of certain wireless stations, and a subsequent one with a secret clause attached, in which a Japanese concern obtained a monopoly of radio communications.. Ignoring its obligations under these two agreements, the same group of Peking officials subsequently signed another radio contract with an American concern. Japan naturally protested against the execution of this agreement insisting upon the validity of its prior rights. In this she was joined by Great Britain and Denmark. The American government took the stand. that the Japanese contract being a monopoly, was a violation of the "open door" principle and the Washington treaties, therefore void. Secretary Hughes following the precedent of Mr. Taft informed the Chinese government that cancellation of the American contract would be considered an unfriendly act. Japan has adhered throughout the controversy to the validly of the Mitsui contract, while America has just as firmly maintained that it is a violation of the "open door" principle.

Japan offered to settle the dispute by amalgamating its rights with the American company and operating the service under joint control. For awhile it appeared that this solution would be accepted, but sometime last autumn the American government reverted to its original position and declined to accept any compromise embracing joint control. Placed between two fires, the Chinese government has, in effect, asserted its sovereignty by declaring that all contracts are valid.

The American wireless rights have since gravitated by the usual financial paths under control of the Radio Corporation of America. This corporation has acquired all the preferred stock and sixty per cent. of the common stock of the Federal Telegraph of Delaware which took over the holdings of a company of the same name incorporated in California, including the $13,000,000 contract for the construction and operation of radio stations in China.

The federal trade commission now reports to Congress that the Radio Corporation of America maintains a monopoly of radio service by reason of its interlocking international agreements. If the findings of the federal trade commission are sustained it is difficult to see how any independent concern can hope to operate a radio service from China to America. The Radio Corporation may not hold a monopoly in China, but if it exercises a monopoly in America, the door is closed to any other company which might desire to take advantage of the principle of equal opportunity in China for trans-pacific communication.

Inasmuch as the American government has insisted upon the nullity of the agreement between China and the Mitsui Company, the report of the federal trade commission will materially strengthen the Japanese position. The report would seem to charge the American government with encouraging and supporting a monopoly of radio service in America while seeking to prevent

any foreign company from enjoying a similar advantage in China. Under the treaties the position of the American government may be unassailable, yet if the report of the federal trade commission is true to fact, our moral position is extremely vulnerable. In the face of this report, it would seem that the sooner America and Japan comes together in some compromise on the China dispute that will establish joint control and co-operation, the better it will be for all concerned.

" At the present time," says the report, "the Radio Corporation has in operation communication circuits with Great Britain, Norway, France, Germany, Poland, Italy and Japan. It is expected that a station in Sweden will be completed and ready for operation within the next six months and that the station near Buenos Aires will be completed in the near future.

Continuing, the report says: " Because of the provisions of the various agreements the corporation has with foreign companies for service through the facilities of the Radio Corporation exclusively it is not believed that it will be possible for any other company in the United States to conduct an efficient transoceanic service. In fact, a group of newspaper publishers in the United States who sought to erect a station for the receipt of radio messages, after conducing experiments in this country, eventually built such a station at Dartmouth, Nova Scotia. This station now is being operated, its service being supplemented by virtue of an arrangement with the British Postoffice. The following members of the association operating such service are: *Chicago Tribune*, *New York Times*, *New York World*, *New York Herald*, *New York Tribune*, *Philadelphia Public Ledger*, *United Press*, *International News Service* and *Universal Service*. The association of newspapers is not exclusive and business for other newspapers is conducted at one cent a word."

The commission's report goes exhaustively into the history of radio development as a means of communication in the United States beginning with the formation of the Marconi Wireless Telegraph Company of America with a capitalization of $10,000,000 in 1899, down to the organization of the Radio Corporation of America by the General Electric Company, October 17, 1919. Discussing the hold the Corporation has upon international communications, the report says:

" The Radio Corporation is the only concern now engaged in transmitting and receiving radio messages between the United States and foreign countries, and contents that in order to function properly it must of necessity secure a monopoly in this field. The company has secured a virtual monopoly and controls all the high power stations, with the exception of those owned by the government. In addition, it has entered into traffic agreements with the various foreign governments and radio companies, the majority of these agreements providing that all messages intended for the United States shall be transmitted only through the facilities owned by the Radio Corporation of America. Agreements of this character have been made with Marconi's Wireless Telegraph Company, Ltd., covering the British possessions, and the governments of Norway, Germany, France, Poland, Sweden and the Netherlands. An agreement of a similar character between the Marconi Company and the Japanese government was assumed by the Radio Corporation when it purchased the assets of the Marconi Wireless Telegraph Company of America and traffic by radio between the countries established. In 1921, the Radio Coporation entered into an agreement with Marconi's Wireless Telegraph Company, Ltd., a British concern, the Compagnie Generale de Telegraphie sans fil, a French concern, and the Gesellschaft Fuer Drahtlose Telegraphie m. b. H., a German concern, respecting radio traffic from South American countries, which was afterwards extended to Central American countries. Steps have been taken to establish service between Brazil, Argentina, Colombia, Venezuela and the United States. This agreement was made subject to the rights of the United Fruit Company in Cuba, Colombia, the Panama Canal Zone and Central America, and its agreement with the Radio Corporation whereby it agreed not to establish or operate stations for wireless communication outside the allotted territory.

"The Federal Telegraph Company of California, which is engaged in a ship-to-shore communication service on the Pacific coast, in 1921 entered into a partnership agreement with the Chinese government, providing for the erection of stations in China and the establishment of a transoceanic service. This agreement was assumed by the Federal Telegraph Company of Delaware, which was organized by the old Federal Company and the Radio Corporation. An agreement between the various companies holding concessions in China was also proposed. The agreement was apparently not executed, and the correspondence with the navy department shows that the department would oppose any agreements of this character unless they were first approved by the respective governments. In a letter to the secretary of state dated December 16, 1921, Mr. Denby, secretary of the navy, emphasizes the importance of maintaining competition in radio communication to and from China. The possibility of a monopoly in other fields than that of service is also pointed out, as is shown by the following excerpt from the letter:

" The navy department fears that any commitment on the part of the government to an arrangement favorable to a monopoly by a single commercial company, though limited to a particular service, would but lend a means toward extending monopoly to other services, such as development and distribution of apparatus in general, and this is considered absolutely undesirable, particularly in the field of supply and service to ships.' "

The Radio Corporation's grip on the patents and devices necessary to handle the radio situation also is discussed at length. On November 20, 1919, the corporation entered into an agreement with the Marconi Wireless Telegraph Company of America whereby the corporation issued to the Marconi Company 2,000,000 shares of its preferred stock in exchange of the physical properties, patents, licenses and good-will of the Marconi Company. On the subject of the so-called cross license agreements the report of the trade commission has this to say:

" The Radio Corporation has entered into agreements with the various companies which own or control practically all patents covering radio devices considered of importance to the art. The number of patents involved, approximates 2,000. Agreements of this character have been entered into with the General Electric Company, Marconi's Wireless Telegraph Company, Ltd., American Telephone and Telegraph Company and its subsidiary, the Western Electric Company, the United Fruit Company and its subsidiary, the Wireless Specialty Apparatus Company, The International Radio Telegraph Company, the Westinghouse Electric & Manufacturing Company, and the Radio Engineering Company of New York. With certain minor limitations, the Radio Corporation under these agreements has secured an exclusive divisible right to sell and use the radio devices covered by the patents involved or by patents which these companies may acquire before the termination of the agreements. The agreements with the American Telephone & Telegraph Company and the Western Electric Company are to terminate in 1930, while the remainder are to terminate in 1945. Provision is made for the mutual exchange of information relating to radio, and, in most instances the Radio Corporation has granted to the other company a license under its patents to make and use devices in the particular field in which the other company is interested."

* * *

An Assurance of Friendship

THE strong revival of the friendly feeling between America and Japan was dwelt on in an address delivered in the United States by the Japanese ambassador at Washington, Mr. Massanao Hanihara, who declared that the interests of the two nations are so nearly identical that both will gain advantage by working together in friendly co-operation, and that neither can afford to follow any other course, or even think of doing so.

Trade figures quoted by Mr. Hanihara show the increasing dependence of Japan upon the United States and of the United States upon Japan for trans-Pacific business. Between 1914 and 1922 the trade between the two countries increased from $146,600,000 to $684,000,000. Japan is bending all its energies to manufactures so that it may have exports with which to get the money to buy food for its teeming millions. In industrializing itself, and restoring the cities and regions devastated by the earthquake, Japan needs everything—steel, machinery and lumber—which goes into manufacturing and restoration work. These billions of dollars worth of materials she will buy largely from the United States. Even upon no higher ground than business, it would pay neither country to quarrel with the other, and this mutual interest is an assurance of continued peace.

* * *

Common Sense Wins

HOLLAND'S parliament, says the *Brooklyn Eagle*, saved the Dutch taxpayers about $50,000,000 by ousting a ministry and turning down the plan to create a much larger navy "for the defense of the Dutch East Indian possessions." Approximately the same sum is saved to British taxpayers, as after parliamentary defeat Premier Baldwin definitely abandons the notion of vast expenditures in the fortifications of Singapore, concededly in a magnificent position to command the Malacca passage and in large measure to dominate the waters of the Far East.

Now Holland is not afraid of the United States, and Britain is not afraid of the United States. The motive of the statemen who honestly thought it wise to increase naval and military defenses for the Netherlands with 50,000,000 subjects in their islands, and for Britain with her hundreds of millions in the islands and in India, was frankly if not fully expressed in discussion. It was fear of Japan.

It is a hopeful sign that calm-minded Dutchmen and calm-minded Englishmen refused to be scared. They are willing to have a sharp watch kept on Japanese proceedings, they will back up their leaders in resistance to encroachments, but they do not care to invite hostilities by a show of insulting force in a part of the world where the Japanese are naturally jealous of race prestige, and naturally sensitive about hints of occidental coercion.

Gee: What a Graft!

Sixty Million Dollar Gold Subsidy for 832,285 Tons of Philippine Sugar: Equivalent to 3½ cents a Pound—And Still They Lose Money!

By Evett D. Hester, Professor of Economics, University of the Philippines

EDITORIAL Note: Mr. Evett D. Hester, professor of economics in the University of the Philippines, gives us a very timely and interesting analysis of the insular sugar industry, presenting facts and figures which prove that the cane is planted and harvested by government loans, capitalized by government subsidy and marketed by virtue of federal protection, displacing in a fictitious home market an equal quantity of American capitalized Cuban product. In the event of Philippine independence the United States is bound by treaty to allow Cuban sugar a twenty per cent. preference over all foreign sugars including the Philippines. The wholly artificial conditions upon which the Philippine industry has thrived, cannot always endure. The end of subsidy and loans is at hand, an end of federal protection is not improbable and the Philippine industry must stand on its own bottom and the product forced into its natural market in Europe there to compete with European beet sugar. Under present conditions the Philippine industry cannot hope to compete and unless the cost of production is lowered and more efficient methods adopted, the sugar industry of the islands must perish. We pointed out when the present system of financing the sugar centrals was adopted that the venture could not succeed. There is only one guarantee for the safe and profitable operation of a central factory that has to advance funds to the farmers for the planting of a stipulated amount of cane for delivery at the mill. That guarantee is a mortgage on the lands of the farmer, who in the event of not living up to his contract with the central factory, faces forclosure and the loss of his property. As Mr. Hester points out, the debtor planters desire the control to rest with themselves or with the government which they can influence through politics. In the new scheme for saving the industry with outside capital they are asking in effect for a further extension of the principle upon which the industry has been wrecked; bonding without effective security or guarantees that they will live up to their share of the bargain. It is impossible.

Mr. Hester shows that during the period 1917-23 the tariff profit to Philippine sugar producers arising out of the free entrance of their product into the American market, amounted to $29,575,-071. This constituted a free gift from the American people, taken out of their treasury and handed over to their Filipino wards. The amount of local or insular subsidization enjoyed by the same producers, Mr Hester places at $30,000,000 which we interpret as meaning the $20,000,000 capital invested by the government in the six government centrals plus the deficits incurred in their operation to date. These figures are illuminating and tell us that the sugar industry of the Philippines has cost the American and insular treasuries the round sum of $60,000,000 gold, equivalent to $730 a short ton or about 3½ cents a pound on the 16,645,705 cwt. of sugar produced and exported to the United States since 1917.

Before the war the sugar manufacturers of Cuba made a fair profit when they could produce sugar at two cents a pound, in some favored instances this cost was cut to a little over one cent. We have reason to believe that these costs have not materially changed, but granted that they have doubled, it would appear that the Philippine industry has been subsidized to date for an amount equal to the cost of production—and still they cannot make a profit. Sixty million gold dollars subsidy for a total production of 832,285 short tons of sugar is some philanthrophy! Gee: what a graft!

G. B. R.

The Philippine Sugar Industry

Since early in the nineteenth century Philippine sugar (cane) has appeared in export, becoming significant in the seventies at over two million English hundred-weight. There was a gradual increase from 1875 to 1895 with no fluctuations below the two million mark. In 1895 over seven million hundred-weight was exported. Between 1895 and 1904, due largely to public disorder, exportation dropped to an inconsiderable position. By 1905 a recovery had been made and the volume from that time to this has fluctuated between two and five million hundred-weight until 1922 when the eight million point was reached.

Relative to other Philippine exports, sugar exceeded 30 per cent. of all exports and held premier rank on a basis of value from 1855 to 1895. This relative importance was lost in 1896 and not regained until 1920 when the centrifugal product had replaced to a considerable extent the muscovado. In that year sugar assumed again first place among Philippine exports. Centrifugal sugar entered the export lists in 1914. Since 1920 it has constituted the bulk of all sugar exported.

With the exception of but ten years between 1855 and 1905, over 20 per cent., on a basis of value, of the Philippine sugar export has reached the United States. Not infrequently during this period the proportion exported to the United States exceeded 50 per cent. and in six years exceeded 60 per cent. The relative importance of the United States market declined considerably between 1895 and 1907. From 1908 until the present the average proportion sent to the United States has been 60 per cent. In 1922 over 78 per cent. in value of sugar exports went to the United States. The reason for the apparently stable United States market for Philippine sugar is two-fold: (1) favorable free entry as against foreign and Cuban sugar since 1913; and (2) the recent change from muscovado to centrifugal product limits the export of Philippine sugar to either the United States or Europe, effectively closing the Asiatic market. The first cause is undoubtedly the greater. Indeed, the second may well be looked upon as a result rather than a cause. By 1900 the United States began to limit its purchases to centrifugal and the shift in Philippine manufacture, muscovado to centrifugal, was a direct response—a necessary change in order to hold the United States market.

Federal Protection of Philippine Sugar.—Considering the facts—that very little American capital is interested in Philippine sugar production, that, on the contrary, American capital virtually controls the Cuban output, that the Cuban output is in excess of United States imports, that every pound of Philippine sugar entering the United States forces a pound of Cuban sugar to the less favorable European market—it must be apparent that free entrance of Philippine sugar while Cuba is held to a stiff duty, constitutes a deliberate and politic protection accorded the Philippines against the interest of American capitalists. The schedules of tariff follow. They apply to 96° centrifugal sugar although several lower schedules hold for 70° to 90° products.

(*a*) Underwood Tariff, October 31, 1913, to May 27, 1921:
- (1) $1.26 a cwt. against foreign countries, except Cuba.
- (2) $1.00 a cwt. against Cuba.
- (3) Free for Philippines.

(*b*) Emergency Tariff, May 28, 1921, to September 22, 1922:
- (1) $2.00 a cwt. against foreign countries, except Cuba.
- (2) $1.60 a cwt. against Cuba.
- (3) Free for Philippines.

(*c*) Fordney Tariff, September 23, 1922, to date:
- (1) $2.21 a cwt. against foreign countries, except Cuba.
- (2) $1.76 a cwt. against Cuba.
- (3) Free for Philippines.

The increasing monetary value to Philippine producers of free entrance to the United States market is tabulated below.

TABLE I.—*Showing United States Tariff Advantage to Philippine Sugar Producers.*

Year	Exportation to United States 96° centrifugal cane sugar	Tariff rate against foreign countries except Cuba	Tariff profit to Philippine producers as compared with foreign producers.	Tariff rate against Cuba.	Tariff profit to Philippine producers as compared with Cuban producers.
	cwt.	*dollars per cwt.*	*dollars*	*dollars per cwt.*	*dollars*
1917-1918	1,392,111	1.26	1,754,060	1.00	1,392,111
1918-1919	562,396	1.26	708,619	1.00	562,396
1919-1920	907,016	1.26	1,142,840	1.00	907,016
1920-1921	3,573,390	1.26	4,502,471	1.00	3,573,390
1921-1922	5,232,231	2.00	10,464,462	1.60	8,371,569
1922-1923	4,978,561	2.21	11,002,619	1.76	8,762,267
	16,645,705		29,575,071		23,568,749

Table I indicates the possible maximum and possible minimum advantage accruing to Philippine producers, through their ability to enter their commodity free of duty into the highest sugar market of the world. The maximum is arrived at by taking advantage of the duty against foreign countries, except Cuba, which amounts to $29,575,071 for the six-year period, 1917 to 1923. The minimum is arrived at by taking advantage of the lower duty against Cuba, which amounts to $23,568,749 for the same period. The actual advantage lies between these points, probably nearer to the maximum. For conservative estimation the norm, $26,500,000, may be taken as a sure total momentary advantage enjoyed by the Philippine producers during the period 1917 to 1923.

Local Subsidization.—It may be considered that the federal protection extended to Philippine sugar would have in itself constituted sufficient encouragement to the production of centrifugal sugar in the islands. Such, however, was not the case. Muscovado sugar had required little capital and small technical efficiency, whereas centrifugal sugar was found to necessitate heavy investment and expert management. The production of modern elaborated agricultural commodities requires in notable degree industry, ingenuity for management, and a fund of savings for investment. The islands possessed, of these three requisites, the industry, but neither of the other two. Foreign capital was diverted in Europe by war and disorder, in America by the absorption of alien-held securities thrown on the market because of war, and by post-war industrial impetus. Entrance of foreign capital was, moreover, discouraged by strictly limited land laws enacted, be it said, by the early, American, and absolute Philippine commission. But, although the Philippine islands was in possession of no surplus personal wealth for the capitalization of centrifugal mills during the war and post-war years, the extremely favorable balance of trade drew heavy revenues to the insular government. These revenues stacked up annually to twice the average yearly budget. Much of them was expended in extension of a theretofore economical governmental machine. Still there remained an excess. The paucity of modern industries, the improbability of individual initiative undertaking them, combined with the political value of a treasury surplus led the local government into a strong and unresisted temptation toward the fantasy of government ownership. Railroading, coal, petroleum, cement, were undertaken on a national ownership basis. Incontinent loans for the building of cocount oil and sugar mills were made. These operations headed up in a National Development Company for mineral industries and a National Bank (92 per cent. government owned) for agricultural and commercial loans. When, under these ambitions schemes the actual surplus was early consumed, resort was had to the entirely reprehensible act of removing the gold reserves behind the Philippine currency from safe American depositories and adding them to the capital of the National Bank.

In such manner, it became possible for government to furnish some $20,000,000 as against the planters $3,000,000 for the establishment of six sugar centrals. During the period 1918 to 1920 these centrals were built and largely put into operation. Government investment in them was secured by mortgages of the centrals and the planters' lands—mortgages confessedly non-collectable. To date the capital and interest have not been satisfactorily liquidated. In the financial management of the centrals, there had by 1922 been incurred deficits of $4,000,000. In 1921 the National Bank to protect its interest took over the management of the mills and organized the Philippine Sugar Centrals Agency to consolidate and economize in operations.

As to the production of sugar, the centrals to-day rank a success; as to financial management, they have been a complete failure and the government has until very lately lost on every unit of sugar produced. Only the planters may have profited as they have been in a position to throw the bulk of capital cost on to the government.

The amount of local subsidization enjoyed by Philippine producers of centrifugal sugar, around $30,000,000, is about equal to a yearly budget of the insular government. Moreover, the amount is equivalent to more than one dollar out of six of revenues received from all sources by the government during the years 1918 to 1922. It is doubtful if any government, other than that of the Philippine islands, has in modern times devoted in proportion to its income so liberal an aid to any one industry, or in fact, to any group of industries.

Liquidating the "Bank" Centrals.—Before the subsidized centrals had fairly begun operations, the islands' trade balance swung to the negative and there came demand for the legitimate use of the dissipated currency reserves. The peso began a dangerous downward fluctuation. There came months when no exchange could be had, when practically the only sources of negotiable value attaching to Philippine currency were the intrinsic value of subsidiary coinage and the name of the United States of America printed on the face of the notes.

Rehabilitation, theoretically, could have been effected by selling the fixed assets of the Bank's industries including the sugar centrals. There was no use to attempt solution of the political difficulties surrounding such a procedure because there were at the time no purchasers. As an indirect policy had been employed in capitalizing the sugar and other industries, so an indirect method was followed in re-capitalizing the reserve funds. No direct appropriations from revenue were resorted to. Instead, the Philippine islands unhesitatingly, but necessarily increased the national debt by $51,000,000—rising from $16,000,000 in 1916 to $67,000,000 in 1923—an increase of over 400 per cent. This was accomplished by the perilously simple process of selling bonds endorsed by the United States, to citizens of the United States.

It was assumed that at least a part of the increased debt could be offset by selling or bonding the sugar centrals. Sale of centrals would necessarily have to be to the planters, to other local capitalists, or to American capitalists.

The same planters who could not pay the interest and principal of the construction loans on the centrals obviously could not purchase except on a long time amortization, which would defeat the ends of the administration—"to get the government out of business." Very recently (September 1923) an option for the sale of Binalbagan, the largest, and potentially the best, of the "Bank" centrals, valued at $5,500,000, has been granted to a group of local capitalists which includes some of the planters whose lands are contributary to Binalbagan. The figure is for 80 per cent. of the original value: the time is three years; and both the option and the installments, in case of sale, are well secured. The National Bank management is to be congratulated on this excellent stroke of business.

If, by any chance, similar disposition could be effected before the end of 1924 in the case of the remaining five "Bank" centrals, and if firm efficient authority, such as now exists, should continue in the Philippine National Bank, thus obviating any leniency in collection of payments, the losses of sugar subsidization would be largely avoided. However, as time goes by, the interest, straight and compound, on the construction loans piles up and results in an impossible ratio between the book and replacement values of the properties. With the scarcity of local capital, reasonable sale locally of all centrals is scarcely to be expected.

Suggestion of sale to American or foreign capitalists results in a tremendous political opposition. Planters are not willing to consider themselves bankrupt, although that is the status of many of them. It is the old story of paternal loans and government ownership. It illustrates perfectly the thesis that the government in business is usually an exception to all canons of good management and commercial ethics, and that when so employed the government is wont to place itself above the very code to which it holds its private competitors. It is safe to say that if the Philippine sugar central mortgages and planters' land mortgages were held by any private bank or syndicate, foreclosure would have been impressed on centrals and lands in Philippine courts of justice over two years ago.

For a time attention was focused on a general bonding scheme to include all six of the "Bank" centrals. This culminated in but one offering, the so-called Hardon scheme (August 1923) which was rejected by the planters without whose co-operation any holding company would find operation very difficult.

There are three factors in the bonding problem: the government holding frozen credits; the debtors, sugar planters, holding influence; and the investors holding cash. In any attempt to bond, there at once appear three points for settlement: (1) valuation; (2) guaranteed interest; and (3) control.

The debtors and investors agree to bond if government will write off or defer (which perhaps means the same thing) about one-half of the book value of the credits. This reduction is requested due to the fact that construction of centrals was undertaken at peak of supply and material prices, so that buildings and machinery can, it is alleged, be replaced at one-half their book value. No responsible independent appraisal of assets has been made to date

and there exists no grounds on which to figure depreciation. The Hardon bonding plan called for a practical depreciation of 50 per cent. Compared with the 80 per cent. sale figure in the case of Binalbagan this seems rather too great. Replacement value is, nevertheless, the only basis of physical inventory acceptable to bondholders. Who shall stand the depreciation? The planters point to the government. The government has a legal right to force the entire depreciation on the planters, a moral right to share it half and half, but possibly, the political necessity of shouldering it entirely.

The second point in issuing bonds, one which seems not to have attracted much attention when it appeared as the most significant clause in the Hardon bonding plan, is that the government should be required to guarantee the interest on the bonds. There is not a great difference between government ownership and government guarantee of interest on bonds. The chief difference between the two is that in the former the government has control while in the latter bondholders obtain dominance. Government management is invariably modified by political viewpoints; control by bondholders is usually efficient, but contrives somehow to disburse income to the holding company and, however prosperous the property may be, to pass on at least a part of the interest payment to the government.

There remains the question of control. Investors, speaking the only known language of secure capitalization, demand control equivalent to investment and naturally refuse to enter on a minority basis unless provided with a voting trust. The debtor planters desire that control rest with themselves or with the government wherein their voices bear a significant import. The planters are thus asking, in effect, bonding without effective security. It is impossible. No bonds will ever be floated on such a basis. The government might be willing to accept a 50 per cent. depreciation, it might be willing to guarantee interest on bonds, but there is small chance of planters and bonders agreeing on the point of control unless the former are forced to it by stern measures. If the planters insist on their stand, they merely force the government to give them the property outright, to accept a lengthy amortization, or to foreclose. Of these alternatives: outright gift would constitute an impossible use of government revenue; amortization would keep the government in business indefinitely; while foreclosure and outright sale to highest bidders, not only of the centrals but also of the planters' lands which stand mortgaged to the National Bank, would let the government out and permit the logical development of the sugar industry—but of a sugar industry which would be largely owned by American or foreign capital. The government has generously waited two years and it is only a question of time before foreclosure will result and the planters need make haste it they care to avoid that event through bonding or local sale.

Crop Loans.—The sugar planters have been raising sugar cane and manufacturing sugar for thirty years. The last ten years have been years of decidedly high-priced sellers' markets. Depsite this fact, a large part of the crop is planted and harvested on loans which now amount to about $2,000,000 annually. It would not, surely, be unreasonable to suppose that after so many years, after enjoying a tariff-protected sellers' market for ten years, and after having their mills capitalized on generous terms by their government, the planters might have some apparent wealth, sufficient at least to put in the next year's crop. However, in all too few cases has this been true. There has been a plethora of extravagance and some gambling. Many planters have yet to exhibit the fundamentals of thrift. Of industry they have a-plenty, but the success of an economic enterprise depends on three things: industry, ingenuity, and *thrift*, and of these *thrift* is the greatest.

Plants cannot afford to be looked upon as wayward nursemaids of an infant industry—they must become dependable, thrifty men of affairs if they wish to control so important a factor in Philippine prosperity. To date, the bulk of sugar crop loans has been derived from government funds. There is a fast approaching end to the inverted cornucopia theory of government in the Philippine islands.

The Future Market.—In world commodities there frequently exists a phenomenon which for want of a better term may be called "the double market." This is true of Philippine sugar. There is an *actual and fictitious market* for all Philippine centrifugal sugar in the United States due only to free entrance as against Cuba. Without free entrance and $1.76 cwt. against Cuban sugar there would be no American port receiving Philippine sugar. The *natural and ultimate market of* Philippine sugar is Europe. The conclusion is upheld by a survey of regional production and consumption of the commodity. Such a survey is presented statistically for recent years in Table II.

TABLE II.—*Regional Production and Consumption of Sugar (Cane and Beet) in Short Tons.*

Region	Production 1921-22	Production 1922-23	Consumption 1922	Probable consumption 1923	Probable surplus 1923	Probable shortage 1923	Probable world surplus 1923
Americas ..	9,020,222	8,344,125	7,302,000	7,509,240	834,885		
Asia	5,900,625	6,059,250	4,893,750	4,991,625	1,067,625		
Australasia	409,500	373,500	315,000	321,300	52,200		
Europe ..	4,541,625	5,191,875	6,801,750	6,937,785		1,745,910	
			Totals ..	..	1,954,710	1,745,910	208,800

Table II indicates that Europe alone has a sugar deficiency. Remove the United States advantage accorded Philippine sugar and the United States would supply itself entirely from Cuba and the Caribbean littoral and leave Philippine sugar to Europe—its natural market. The significance of this condition lies in the fact that, for permanency of the local industry, the cost of production must be lowered to meet the competition in European ports with European beet sugar. If our planters continue to devote any proceeds of the free entrance returns to cost of production—if they are satisfied with an annual profit of $10,000,000—they may eventually find themselves without a market whose average price will be higher than their production cost.

The market for Philippine centrifugal sugar must normally pass through two, possibly three, phases. The first phase will cover that period during which a fictitious United States market will be assured through the extension of a preferential tariff schedule to the Philippine islands. Such a phase we are now enjoying and will continue to enjoy until one of two things occur. Should the American consumer come to believe that the duty on Cuban sugar is the cause of the high retail price of the refined product, the Cuban duty will be taken off. The American housewife wishes to buy twenty pounds of refined sugar for a dollar as she did in 1910, and considering her boycott proclivities it is not beyond the bounds of reason for her to approximate that ptice. It does no good to tell her that sugar at ten cents a pound is the world's cheapest edible carbohydrate. Again, should a purely locally owned production reach such proportions as to come into vital competition with the American capitalized Cuban product, there would be a strong movement to abandon free entrance of Philippine sugar. Either of these eventualities would end the present market for Philippine sugar. The chances of abandoning the free entrance favor would be decreased if any considerable amount of American capital were invested in the local industry. In the event of Philippine independence the United States is bound by treaty to allow Cuban sugar a twenty per cent. preference over all foreign sugars including the Philippines.

The second phase of the marketing of Philippine sugar will be contingent upon the cessation of the first phase. It will be signaled by the necessity of discovering, competing in, and holding a European market. Successful tenancy of such a market would depend, as mentioned, on ability to produce and lay down in European ports at a cost equal to or less than the cost of production in Europe of beet sugar. Whether the Philippine producers will be able to accomplish the movement cannot be forecasted. On their present plane of efficiency they could not. Because of post-war conditions in Europe, especially the depreciation of old world currencies, it is not profitable to attempt an analysis of present cost of European beet production.

The more remote third phase in the marketing of Philippine sugar would be dictated by the establishment of an American demand exceeding possible production in the United States, Hawaii, Cuba, the Caribbean littoral, Central America, and Northern South America. In this case, there remaining a regional deficiency in the Americas, Philippine or other Asiatic sugar would be called upon to re-enter the United States at favorable prices.

Thus it must be held in mind that on a basis of present analysis the *natural* market for Philippine and other Asiatic sugar is Europe, not the United States; that the *natural* competitor with Philippine and other Asiatic sugar is European beet sugar, not Cuban cane sugar; and that for permanency of the local industry cost of production must be radically lowered.

Summary.—Philippine sugar has been in the past and is again to-day the first of Philippine exports. It has become in bulk a centrifugal product, planted and harvested by government loans, capitalized by government subsidy, and marketed by virtue of federal protection. An end of subsidy and loans is at hand, an end of federal protection not improbable, and the necessity for clear, farsighted efficiency in production impends.

"American Policy in China Has Not Changed, But—"

IT would appear that the *China Press* and the *China Weekly Review* are edited by the same person from the context of the editorials. Although appearances are often deceitful, there are many other factors in the situation which might lead one to believe that the same master mind is responsible for an identical accusation in both newspapers that Secretary of State Hughes has committed an indiscretion for which in another country he might soon enough find himself without portfolio.

The matter hinges upon a letter at first reported to be published anonymously and now attributed to the secretary of state of the United States. This letter was not sent through the usual diplomatic channels. It was not given to the Chinese minister in Washington nor to the American minister in Peking. It was not addressed officially in any way. According to both newspapers it was written to someone, name not given, who in some way is related to someone on the republican national committee in the United States.

The letter may be perfectly genuine, probably is, but from its character it can but be the private expression of opinion on the part of one American citizen to another and therefore of little value or significance. Not even the secretary of state of the United States can change the American policy in China because such a change would require armed intervention in China as well as a conflict with all or one of the powers signatory to the agreements reached at the Washington conference. It is the maximum of futile logic to believe that the United States would, on its own, send armed forces into China. It is equally unknowing to assume that all of the nations signing the Washington agreements would agree to armed intervention. Besides, armed intervention would require in the United States, an act of congress; in Great Britain, the agreement of the labor party ; and in Japan, the consent of those who effected the change of policy to one of friendship for China. Can any sane man believe that such things can come to pass ?

What then is the purpose of the Hughes letter ? Were it to shame the Chinese government into constructive activity, it might have been given to the Washington correspondents of the universal press to be scattered throughout China and the capitals of all countries interested in China ? It might have been sent to various officials and thus given to the world. It might have been sent to the American chamber of commerce in China in reply to their plethora of *communiqués* from this country on the horrible conditions prevailing here, where after all, most of us live quite comfortably. It might have been delivered in an address before some organization interested in China. Why was this one-time anonymous letter sent to some obscure person and finally published in a weekly paper, given recently to condemning everything in China and finally appearing in the editorial columns of a daily newspaper whose editorials are written according to local rumor by the same man who edits the weekly paper.

One sentence in the letter will be particularly gratifying to those Chinese who have maintained for years that all the foreign powers, particularly the United States, has actively intervened in Chinese affairs.

Mr. Hughes is reported to have written :

" We have done what we could to strengthen it (the Chinese government in Peking) and to give it the opportunity for development. But that development must of necessity take place from within."

The Peking government has within recent years never been the government of the whole of China. It has been little more than a political party temporarily in power. At present it is the Chihll party. It is reported that Tsao Kun is dying ; should he die, it may be some other party, perhaps some branch of the Chihli party. The Peking government has not only not been able to control the southern and southwestern provinces of China, but it has not been able to control provinces adjacent to itself. Chihli, for instance, would have none of Li Yuan-hung. Wu Pei-fu is at present in conflict with the Tientsin-Paoting faction of the Chihli Party in power. Kiangsu is rummaging all on its own. Yet these are supposed to be loyal provinces. Now, Mr. Hughes must have been cognizant of these facts, for they are too obvious for anyone to overlook except a petty propagandist intent upon helping one side or another. Omitting even the constant defection of such men as Sun Yat-sen and Tang Chi-yao, one has the less constant independence of Chang Tso-ling in Manchuria and Lu Yung-hsiang in Chekiang. And again one has the personal independence in spite of declared provincial loyalty of all the *tuchuns* in every province of the country.

Who then was Mr. Hughes strengthening ? Was he strengthening the Anfu Club against the Chihli party, or the Chihli party against the Kuomintang, or the Manchurian warlord against the Loyang warlord ? His letter is reported to state that the United States was strengthening the government of China. What government ? Where is the government ?

This leads to one other consideration. The republic of China is trying to find a way of governing itself. It has got lost. It will probably find a way out of the maze. It has found its way out several times before in its history. But all this takes time, and now more time than before, because the problem is complicated by mistakes made in the early years of the republic and by such implied intervention as Mr. Hughes is reported to have participated in. Does strengthening the Peking government imply that the United States is going to interfere in the internal affairs of a country and to prevent the people of that country from fighting for their liberties against armed tyrants who are grinding them under the heel ? In, for instance, permitting the party in power in Peking to utilize the customs surplus to suppress its enemies and in preventing the party in power in any other place from doing the same, are not the legations in Peking interfering in just this way ?

These are interesting questions facing Mr. Hughes, who has according to his accusers, lapsed from a brilliant secretary of state into a somewhat dubious letter writer.

* * *

The letter is accepted as an indication that American's traditional friendly policy towards this country will be continued but hints at certain modifications in order to cope with the existing conditions. It is hailed by interventionists as a response to their repeated demands for drastic action.

American policy toward China may be modified, but—it is well to read the letter referred to in connection with the more significant speech delivered by the secretary of state on November 30 before the American academy of political and social science at Philadelphia on the occasion of the observance of the centenary of Monroe doctrine. In this, Secretary Hughes clearly defined the foreign policy of the United States, and emphasized that co-operation, not alliances was the basis of our diplomacy. He summed up the attitude of the United States towards Europe in the following terse sentences :

We are still opposed to alliances.

We refuse to commit ourselves in advance with respect to the employment of the power of the United States in unknown contingencies.

We reserve our judgment to act upon occasions as our sense of duty permits.

We are opposed to discriminations against our nationals.

We ask fair and equal opportunities in mandated territories as they were acquired by the Allies through our aid.

We desire to co-operate according to our historic policy in the peaceful settlement of international disputes which embraces the policy of judicial settlement of such questions as are justifiable. It is our purpose to co-operate in those varied humanitarian efforts which aim to minimize or prevent those evils which can be met adequately only by community of action.

In short, our co-operation as an independent state in the furtherance of the aims of peace and justice has always been and still is a distinctive feature of our policy.

There is plainly no inconsistency between these policies and the Monroe doctrine. Our position as a world power has not affected it. The question is whether that doctrine is still important under changed conditions. The answer must be in the affirmative.

In regard to American relations with the Far East he traced our diplomatic relations with China from 1784 to date in the following words :

" In relation to the Pacific Ocean and the Far East we have developed the policies of (1) the open door, (2) the maintenance of the integrity of China, (3) co-operation with other powers in the declaration of common principles, (4) co-operation with other powers by conference and consultation in the interests of peace, (5) limitation of naval armament, and (6) the limitation of fortifications and naval bases.

" The *Empress of China*, fitted out by Robert Morris and others, sailed to Canton in 1784, and by the year 1805 thirty-seven American vessels cleared for that port. In 1843 Daniel Webster, secretary of state, instructing Cable Cushing as envoy extraordinary and minister plenipotentiary to China, said : 'You will signify, in decided terms and a positive manner, that the government of the United States would find it impossible to remain on terms of friendship and regard with the emperor if greater privileges or commercial facilities should be allowed to the subjects of any other government than should be granted to citizens of the United States.'

" Most favored nation treatment was secured in the treaty of 1844, with respect to which Cable Cushing said : 'Thus, whatever progress either government makes in opening this vast empire to the influence of foreign commerce is for the common good of each other and of all Christendom.' Thus was laid the foundation for the policy of the open door, or equality of opportunity. When the great powers took advantage of the weakness of China to obtain spheres of interest in order to facilitate exploitation and restrict free commercial intercourse this government, through Secretary Hay, sought to establish by international accord the principle of the open door and with this to obtain the recognition and preservation of the territorial and administrative integrity of China. Despite many obstacles, caused by the disregard of professions and the desire to take advantage of the opportunities afforded by the progressive disintegration of China, this government continued earnestly to press these principles and at the recent Washington conference the postulates of American policy were taken out of the unsatisfactory form of diplomatic notes and, with a more adequate and explicit statement, were incorporated into a solemn international engagement signed by the nine powers especially interested in the Far East. This treaty has been ratified by all but one of these powers, and it is hoped that ratification by that power will not be long deferred.

" While the diplomatic exchanges between the powers, in which the open door policy was fully accepted, were not, of course, satisfactory and later became largely ineffective, they were so strongly supported by public opinion in this country as to make it clear that while we eschewed alliances we were ready to join in declarations of common principles where his method of co-operation would supply the best means of attaining the desired object. This was again illustrated by the resolutions adopted at the Washington conference.

" Again through the four power treaty between the United States, Great Britain, France and Japan, which is to continue for ten years and thereafter be subject to termination on twelve months' notice, we have established another form of co-operation with regard to insular possessions and insular dominions in the region of the Pacific Ocean.

" It is provided that if any controversy arises between any of the parties out of any Pacific question which cannot be settled by diplomacy, with regard to their rights in relation to these possessions and dominions, they shall invite the other parties to the treaty to a joint conference to which the whole subject will be referred for consideration and adjustment. Also, if the rights sought to be safeguarded by the treaty are threatened by the aggressive action of any other power, the parties shall communicate with one another fully and frankly in order to arrive at an understanding as to the most efficient measures to be taken, jointly or separately, to meet the exigencies of the particular situation."

The key-note of the speech, as indicated above, was co-operation with other powers and it is safe to say that this principle will influence the administration's attitude toward any development that may arise in China. Under certain conditions America may co-operate with other powers in which all concerned will share equally the responsibility; she may, under certain conditions, use her naval forces stationed in China to protect American lines and properties. China will be held to strict accountability for losses to American lives and properties and interference with legitimate trade rights, and, when the time arrives, the bill will be presented and China will pay.

It is hardly probable that the American people will approve of independent intervention in China, when they would take no steps to clean up their own back door, nor is it probable that the present administration will so far depart from the principles laid down at the Washington conference as will provide political opponents with arguments to defeat it during the coming political campaign.

The letter ascribed to Secretary Hughes may forshadow some significant change in American policy toward China, but whatever that change may be, it will in no wise violate American traditions or lead to any independent adventure to place China on her feet.

French Enterprise in the Orient

Like many foreign firms which have opened works in France, certain French firms are pursuing the policy of setting up factories abroad.

One of the latest arrangements of this kind has been made by a number of glass manufacturers. The Société des Verreries d'Extrême Orient is an association representing the Société de St. Gobain, the Société des Glaces Nationales Belges, the Société Financière et Coloniale, the Distilleries Indo-Chinoises, and the Société de Chimie d'Extrême Orient. This organization contemplates doubling its capital of 5,000,000f., and as a means of keeping a hold on the Far Eastern market, will supply buyers there with goods from the factories it controls at Haiphong, Tonkin. There will thus be a great saving in the cost of transport.

* * *

American-Japanese Co-operation

The Mitsubishi-Westinghouse Combination

THE success attending American co-operation with Japan in the combination of the General Electric with the Mitsui interests (known as the Shibaura Engineering Works) in the Tokyo Electric Company, and the Western Electric participation in the Nippon Electric Company has paved the way for another equally important combine in which the Westinghouse Company becomes associated with the great Mitsubishi interests in the manufacture of electrical machinery.

" The new company is known as the Mitsubishi Denki Kabushiki Kaisha, or in English, the Mitsubishi Electric Manufacturing Company, and starts with a capital of Y. 16,000,000.

" The reasons for the formation of this company, as given out in New York by Mr. E. D. Kilburn, vice-president of the Westinghouse Electric International Company, are as follows: The Westinghouse Company has for many years been engaged in promoting the use of electricity in Japan, and its efforts have met with so favorable a reception that Japanese electrical development—including railroad electrification, the use of waterpower, the installation of large steam generating plants and the formation of superpower systems—compares favorably with that in the United States.

" As a consequence of this rapid development, electrical apparatus has become one of Japan's largest imports, and since Japan's principal exports, silk, copper, and objects of art cannot be expanded by a corresponding degree the Japanese began to feel that there was danger of a continuing unfavorable balance of trade. Hence it seemed wise to Japanese interests to begin the manufacture of electrical machinery and supplies in their own country.

" In persuance of this policy, the important Mitsubishi interests, which are engaged in banking, ship building and steel making, approached the Westinghouse Electric Company with a proposal for a co-operative agreement whereby the Westinghouse company was to supply technical skill and experience to a Japanese manufacturing company.

" The Mitsubishi Electric Manufacturing Company is the outcome of these negotiations. The Japanese profit by the arrangement through the employment it will give to Japanese workmen and the improvement in their foreign trade situation, while the Westinghouse company profits by receiving a continuous revenue for services and royalties in lieu of exports, that it was certain to lose within a comparatively few years. The United States profits because if the Westinghouse Company had not accepted this proposal, it is possible that a German firm would have been considered by the Mitsubishi organization.

" The Westinghouse company has subscribed for a portion of the stock of the Japanese company.

" A third party to this agreement is Takata & Co., the well-known Japanese importers, with offices in 30 Church-street, New York city. This concern, which is the Japanese agent of the Westinghouse company, will play a large part as distributer for the Mitsubishi Electric Manufacturing Company and will also continue to import such Westinghouse products as will be supplied from America."

Anti-Japanese Propaganda

Libelling the Japanese Group

"NO loans have been made to or in China by the new consortium, but it is a fact that Japan has made heavy loans both for administrative and industrial purposes since the agreement was signed." This categoric statement is made at the outset of a series of articles which appeared during November in the *Wall Street Journal*, a financial newspaper regarded as an authority by American bankers.

M. Padoux, financial adviser to the Peking government, is quoted as saying "during the progress of the war, Japan was the only member of the consortium who was in a position to supply China with money. It was thus that the Japanese group made the first, second and third advances, though in the name of the consortium as a whole on the second reorganization loan of 10,000,000 yen each in September 1917, January 1918 and July 1918. Besides the official member in the consortium, the Japanese were very active in 1918 making loans to China, some through a group composed of the Industrial Bank of Japan, Bank of Chosen and Bank of Taiwan and some through the Exchange Bank of China. The figure ran up about Y.150,000,000. This aggressive loaning policy stirred up opposition of the Chinese people and attracted attention of the other powers."

It is true that the Yokohama Specie Bank, the only member of the Japanese group in the old consortium, advanced Y.30,000,000 in three installments to the Chinese government secured on the salt revenues in the name of the consortium as a whole. There certainly could have been no criticism on the part of Great Britain or France to such a transaction, which protected their interests and returned the accommodation which the British group extended to Japan in 1913 when the original reorganization loan was issued, in which the British guaranteed the Japanese share and the French group the Russian participation. Throughout the progress of the war the official Japanese group worked in complete harmony with and lived fully up to its obligations with its partners. It had no participation in any of the so-called independent or Nishihara loans, in fact, the Yokohama Specie Bank opposed these transactions. In commenting on Japanese financial activities in China during the war, the fact is overlooked that American bankers had equal opportunities to furnish the Chinese with money in the Lee, Higginson, Commercial and Continental Bank and the Pacific Development loans, which aggregated some sixty million gold dollars, although only the first installments amounting to $11,000,000 were placed on the market. Every opportunity offered by China to Japan was fully equalled if not surpassed by inducements held out to Americans. The combined Japanese transactions fade into insignificance before the 1,500-mile Siems Carey railway contract with the possibility of its being extended another 1,500 miles. At the lowest possible estimate this contract called for loans aggregating $150,000,000 gold, with the privilege of constructing a further 1,500 miles of line at the same estimate. This does not include the estimated cost of the grand canal improvement contract—another $30,000,000 gold. Had the various contracts signed by the Chinese with Americans during the war been carried out, the amount involved would have approximated $400,000,000 gold or four times the total of the Japanese transactions. The Americans, for one reason or another, could not or would not raise the money, while the Japanese carried out their obligations. Had Americans done likewise, probably other nations would have combined to undermine their position in the same manner as they came together to injure Japan.

Historians of the consortium overlook these facts in order to perpetuate a fiction seized upon to justify its creation. For a responsible financial newspaper to publish at this time the utterly mendacious statement that Japan has made heavy loans to China for administrative and industrial purposes since the new consortium agreement was signed, indicates how easy it is for American publishers to be misled by Chinese correspondents whose only stock in trade is an outworn anti-Japanese propaganda. Japan has *not* made heavy administrative or industrial loans to China since the formation of the new consortium. The utmost harmony and complete understanding exists between the groups, especially between the American and Japanese bankers, a fact which the *Wall Street Journal* might have ascertained by stepping across the street and interviewing Mr. Lamont.

A certain amount of legitimate Japanese capital has come into China for industrial development since the formation of the new consortium. So has a certain amount of American capital. The writer of the articles in the *Wall Street Journal* invites attention to the fact that " Arthur L. Burton, chief engineer of the Pao-Cheng Cotton Mills of Shanghai, who returned from a trip to the United States recently, made the statement that one industrial enterprise which calls for an investment of about $15,000,000 gold is now being promoted and that most of this money has already been subscribed in Boston." When the capitalization of the enterprises floated by the late Chow Tse-chi on his last visit to America are added to the above, together with other legitimate American ventures, the total will probably far exceed the amount of Japanese capital invested in China for similar legitimate porposes. To state that Japan is making administrative and industrial loans to China since the signing of the new consortium agreement is an unwarranted slur on the good faith of the Japanese group which has made no independent move since the signature of its representative was affixed to the new compact.

* * *

THIS phase of American indifference towards investments in China is touched upon in the letter alleged to have been written by Secretary Hughes to a member of the republican national committee who has a brother engaged in missionary work in this country. The copy sent to the latter and immediately released for publication in a Shanghai weekly clearly indicates that some " Reverend " had made charges to the effect that Japan was trying to " annex some 200 miles of coast north of Shanghai," providing evidence that the story was placed before Secretary Hughes in order to influence his attitude towards Japan.

The answer of the writer to this should provide food for much thought by those who still believe that everything Japan does in China cloaks some sinister purpose. He says :

> " I acknowledge myself somewhat puzzled by certain of the statements made by the Reverend——in the letter which your brother encloses to you. He says that Japan is trying to get 200 miles of coast just north of Shanghai. I would give no credence to any report that Japan is seeking to annex this territory ; and I assume that the Reverend——refers to the fact that Japanese capitalists are seeking to obtain contracts for certain industrial and agricultural developments in the region indicated by him. There is, so far as I am aware, nothing illegitimate, and nothing extraordinary, in the Japanese projects referred to : so far as my information goes, these plans for conservancy and agricultural works are not fundamentally different from those for which the opportunity has for several years been open to American interests. Having in view the ultimate possibilities of China as a capital market for American manufactures, it is perhaps unfortunate that American capital and industry do not, under present circumstances feel safe in venturing to avail themselves of the opportunities for development in China, but safer to invest in enterprises in Japan, to a large extent leaving the Chinese field to be developed by other nationalities—principally by the Japanese, whose isolated position leads them to develop their economic interests in China for the future. That, however, is a matter of economic conditions, which is not within the effective control of any agency of government. We cannot compel our capital or our enterprise to seek an outlet in China, nor could we prevent their making profitable investments in Japan. Nor, regarding the matter from another viewpoint, would we be able to bar Japanese capital from availing itself in China of the opportunities which are there open. The sole policy for this Government to pursue is to insist that these opportunities be open to all alike, so that Americans may have their fair chance of availing themselves of them if they will."

This is to the point. Present conditions in China are having the effect of influencing American capital to invest in enterprises in Japan, and between the lines, in enterprises in China controlled by Japanese. The American government cannot prevent its nationals from making profitable investments in Japan nor can it bar Japanese capital from availing itself of opportunities in China, nor can it

intervene to prevent Americans from participating in these investments. Americans would much rather co-operate financially with the Chinese for the development of industries in their own country, but until such time as China can provide more adequate guarantees for safeguarding these investments, they will seek opportunities elsewhere.

Sun and the Customs

Hitting the Under Dog

THE foreign press of China has a habit of filling editorial columns with attacks on Sun Yat-sen. The idea is that every time anything goes wrong Sun is responsible. When there is banditry in Honan, the headquarters of Wu Pei-fu, outlawry on the upper Yangtze, the political balliwick of the Chihli faction, or illegal taxation in Chekiang, the headquarters of the Anfu Club or in Kiangsu, a province loyal to Peking, it is a subject for diplomatic discussion. But when Sun Yat-sen displeases the foreigner, all hands rush on board to destroy him.

Sun Yat-sen said that he would seize the Canton customs house and immediately the powers sent gunboats and admirals and all sorts of officials to intervene and if necessary to fire upon the city. When Lu Yung-hsiang in Chekiang interferes with foreign trade by imposing illegal taxes, by seizing foreign goods in foreign-owned warehouses, by forbidding foreign-owned houseboats to ply the rivers of his province, no gunboats are sent, no demonstration is made, no admirals appear on the scene. When Anhwei refuses to recognize the transit pass or Honan permits the kidnapping of missionaries right under the very nose of the greatest of Peking satraps, it is a subject for the soft pedal.

Into the rights of Dr. Sun's contentions it is difficult to go. He claims that it is absurd to permit money to go out of Kwantung into the treasury of those who would utilize it to purchase arms for the subjugation of Kwangtung and the massacring of its people. On the other hand, foreigners must insist that the customs service shall remain intact in accordance with the treaties between China and the foreign powers. Even so superficial a statement of the case brings out the fact that there is much right in principle on both sides. In the method of handling the question, Sun, however, has the advantage over the legations in Peking, in that he has solidly behind him the support of the people of his own province who would regard the question as one of internal politics between the government at Canton and the government at Peking. They cannot see wherein lies the right of foreigners to interfere. If Sun Yat-sen were weak before the customs episode, he was all-powerful immediately thereafter.

It is rather curious to see what shiftings there have been in opinion with regard to China. Those who for years were active propagandists in the cause of China for the Chinese, the damnation of foreign rights in China, the condemnation of Japan and Great Britain for aggression in China, are now the most bitterly insistent upon foreign intervention in some form, with the United States as the chief interventionist. Why these Americans want to throw the full onus of disorders in China and foreigners' mistakes in China upon their own country, is difficult for an American to understand. When they were so pro-Chinese that they outdid the Chinese themselves in Celestiality, they had axes to grind. They wanted special favors from the Chinese to the disadvantage of all other foreigners in China. It is to be presumed that now that they take the other view, they have either not received the favors or they have changed their tactics from cringing mendacity to loud-mouthed blackmail.

In taking such an attitude toward Dr. Sun Yat-sen these men have hit upon the wrong citizen. Sun is afraid of no one. That is perhaps the secret of his enormous success with the Chinese people. He knows exactly what he wants. He knows that it is impossible to achieve his aims as rapidly as even his own most ardent supporters imagine, He knows that to make so large and unwieldy a country as China an effective republic, a modern state, will take a generation, perhaps a century. He appraises the forces of his antagonists both within and outside the country and he realizes that they are legion. But he faces them with the bravery of the certainty of an idealist. He stands before the world the rare exception in Chinese politics, a clean and honest man. When the journalists who edit foreign-language newspapers in China, attack such a man they place themselves in the position of supporting all the filth and corruption in Chinese affairs Sun opposes.

* * *

Intervention?

"IN the event that Dr. Schurman fails in his unofficial mission to induce the Peking authorities to voluntarily allocate Canton's share of the customs surplus for public improvements in this province, what will you do," I asked Dr. Sun two days after his interview with the American minister.

"I will take over the customs," he very quietly but firmly replied. "I may not hold them for more than an hour: I may hold them only five minutes, may be only a second, but I will hold them for that second and force the powers to intervene in the affairs of China on the side of Peking and compel public opinion throughout the world to take heed of the situation."

Dr. Sun Yat-sen will keep his word. If the powers keep theirs, it means intervention on behalf of Peking under cover of protecting the customs. In creates an entirely new precedent in international law and says in effect that any people struggling against a despotic and tyrannical government whose customs revenues are pledged for foreign loans may not hope to strike their enemy in his most vulnerable spot. Dr. Sun further said: "I recognize the moral obligation of Canton to meet its full share of the national debt and am willing to provide all necessary guarantees that the quota collected in the provinces under my control be set aside for the service of the foreign loans secured on the customs. The amount involved in the dispute is comparatively small. I can get along without the surplus if needs be, but I am determined to establish the justice of the principle involved."

"The powers do not recognize me" he continued. "They do recognize Peking. I am at war with Peking. I do not recognize its authority in Canton. We have maintained our independence for several years. Peking is powerless to impose its authority in Canton. The powers, through control of the customs, have paid over to Peking the surplus which has been employed to fit out military expeditions against Canton, forcing us into desperate straits to raise funds to defend ourselves against our enemy. Our people have been mercilessly slain; their lands have been overrun with soldiery; their properties have been destroyed; their women ravished and their homes violated; thousands of lives have been sacrificed in the mad attempt of Peking to place the yoke of submission on our necks. Trade is at a standstill. The Canton-Kowloon railway is taken over for military purposes and foreigners complain because the installments on their loans are not paid. We have been forced to extreme measures to raise funds within the province to carry on our fight for constitutional government. We have been criticized and condemned for the methods we have been forced to employ in raising revenues all because the northern militarists receiving the recognition and support of the powers continue to fit out expeditions for the purpose of invading our province. We will not submit to Peking. We will prolong the war and seize everything that belongs to our enemy. The powers have no right to intervene in this purely Chinese domestic fight. If they have any objection to my taking over control of the customs, let them complain to the recognized government at Peking. When they step between me and Peking and deny my right as beligerant to injure my enemy, it is intervention in the affairs of China. When America entered the war against Germany, her first step was to seize all German vessels in American ports and confiscate other enemy properties. I am doing exactly the same thing with the property of Peking

located in my territory. Nobody has a right to interfere, especially when I recognize the validity of the powers' claim to the customs revenues for the service of loans contracted by China as a whole, and when, furthermore, I am willing to provide guarantees that Canton's share will be paid into the proper depositories for the service of the loan, I am even willing to go further, and guarantee that if the Canton customs revenues falls short of its quota for the service of these loans, I will make up the deficit from other revenues."

"Minister Schurman recognized the justice of my position, and in the discussion as to how actual intervention could be avoided, he offered to propose to Peking through unofficial channels that my claim to a proportionate share of the customs surplus be voluntarily allowed and that the funds be employed for public improvements. I am perfectly satisfied with such a solution, as it necessarily works both ways and the surplus handed over to Peking must also be employed for constructive work. All this is for the benefit of the Chinese people and will aid foreign trade. I gladly assented to any plan which would deprive the militarists of the enjoyment of these revenues and make for the development of the country. The recognition of the principle is all that I am contending for.

"As to the statement that there is no customs surplus, that it has all been employed for the service of internal loans floated by Peking, we maintain that all these loans were dishonest and the proceeds either went into the pockets of Peking officials or were employed in fitting out military expeditions to crush the south. The foreign powers are not concerned with the disposal of the customs after their just claims have been met. They have no jurisdiction or right to intervene for the protection of Chinese bondholders and the south cannot recognize the right of the north to issue loans secured on the customs surplus and employed for fighting the south with. It is only necessary to recall that the inspector-general of customs was compelled two years ago to publicly advertise that certain internal loan bonds were illegally issued, to support the statement that the customs surplus has been raided by Peking for its own purposes. In addition to the internal loans secured on the customs surplus, there are reported to be several millions of dollars of internal loan bonds scattered throughout China and secured on the customs surplus that have been issued illegally by the Peking financial authorities. We cannot recognize these bonds, and the frank attitude of the inspector-general of customs in also repudiating such transactions is proof sufficient that he is dealing with a dishonest government. Coming back to the present situation, we are justified in asking for such percentage of the customs surplus which pertains to Canton after the foreign obligations have been met. We are willing that it be used for the benefit of the public, but unless this is conceded and the rule works both ways, we will see that we collect our share of the revenues at Canton."

This, in effect, describes the situation at Canton, and while recognizing the foreign point of view, it is well not to entirely ignore the Chinese viewpoint. Up to the present, Dr. Sun Yat-sen has scored a victory over the powers. For the first time in years he has compelled the attention of the world. He has puzzled the foreign offices, worried the legations and had the admirals guessing. In 1898, Germany sent two small gunboats into Kiaochao harbor and laid certain demands before the Chinese government. Peking hurried to comply, handing over its most valuable northern port with preferential rights to a whole province. The powers sent 21 gunboats to Canton to coerce and intimidate Dr. Sun Yat-sen. He is still there, and says he will carry out his plans. No matter how foolish he may be according to the foreign way of thinking, Dr. Sun is a great man with the Chinese. He has done something which no other Chinese has dared to do. He has flouted the foreigner and compelled a naval demonstration which overshadows any previous similar incident in Chinese history. His prestige with the Chinese to-day is greater than ever, and if the powers land troops to protect the customs, all China will rally behind him.

The powers are worried. Interference with Dr. Sun spells intervention and the powers know it. The can have no valid excuse after Sun guarantees to protect their interests in the customs receipts. Dr. Sun made a special appeal to Americans for support, but the state department answers that solidarity amongst the powers is essential for the preservation of the customs and will not depart from its present policy. Dr. Sun and his friends point out that America has no special interest in the customs revenues, except for the service of the Boxer indemnity which she long ago remitted in part and is now talking about remitting the remainder. Great Britain, Japan, France, Italy and others are interested in preserving the customs as security for certain loans and the Boxer indemnity, and there is some excuse for their opposition to Dr. Sun's plan. America, continues the intimates of Sun, has made no independent move to protect its loans defaulted by Peking, but joins in on a basis of equality with others for the preservation of their particular interests. International co-operation along these lines in the coercion of China will, in the opinion of Dr. Sun's immediate followers place America in a most embarrassing position with those Chinese who have hitherto relied upon her disinterestedness.

Can America afford to be placed in a position of defeating a people who are struggling for constitutional government under the plea that solidarity of the powers in support of Peking is more important than the triumph of an ideal ? This, at least, is the way Dr. Sun and his associates sum up their argument against America's participation in any further attempt to coerce Canton in favor of Peking.

Sun is determined to force the issue. He will not give way, so he says. He has only temporized because Dr. Schurman offered to use his unofficial position to bring about an equitable solution. If he fails, and Sun proceeds to take over the customs, and the powers adhere to their present position, China will be face to face with intervention. It is to be hoped that Dr. Schurman does not fail.

G. B. R.

* * *

Radio Corporation Enters China Field

The Federal Telegraph Company of California has transferred all of its rights and titles in the $13,000,000 contract for construction and operation of radio stations in China to the newly organized Federal Telegraph Company of Delaware, a $9,500,000 corporation.

The sole stockholders of the Delaware corporation are the Radio Corporation of America and the Federal Telegraph Company of California, it was said.

The China-Federal Radio Company, with $13,000,000 capital, was owned jointly by the Federal Telegraph Company of California and the Chinese government.

* * *

I.B.C. Acquires the Asia Bank

SLOWLY, despite efforts to pull themselves up by the boot-straps, Americans in China are slowly losing the favorable position gained during the war. To the long list of firms who have gone under or pulled up stakes and departed is now added the Asia Banking Corporation, which is to be amalgamated with the pioneer and premier American financial institution in the Orient, the International Banking Corporation.

Details of the transaction are not yet available in Shanghai, but the Asia Banking Corporation officials have issued the following statement with regard to the transfer :—

> "The Asia Banking Corporation has entered into an agreement for the sale of its assets and business to the International Banking Corporation, subject to approval of its stockholders, and a special meeting of such stockholders has been called to act upon such sale. A subsequent announcement will be made as to the date when its business will be transferred to the International Banking Corporation. It is felt that this action will be helpful to American banking interests in the Far East."

The Asia Banking Corporation opened their Far Eastern head offices in Shanghai on February 7, 1919. Since when it has been one of the most popular institutions of its sort to be established in the Far East in recent years. It began its career by instituting American banking methods of the latest style and acquired a large clientele.

The Changing Chinese

By George E. Sokolsky

"THE Chinese have changed." This is a phrase which goes the rounds of clubs, directors' meetings, missionary conferences, newspaper offices and other institutions of comment in China.

The Chinese have changed in their attitude toward foreigners. Nothing could be more natural. They have come to know the foreigners better; they have come to regard them as human beings, rather than as gods utilizing consuls, legations, gunboats, arms and munitions to wreak their vengeance. They have come to like the foreigner better, on the whole, although the adulation for each individual is perhaps less.

In the old days, the average foreigner knew his boy, his cook, his compradore and his shroff. The foreigner who knew a few "pidgin-English" speaking Chinese merchants was a well-informed man. The scholar who knew somewhat of the language and the customs of the place was an exception and generally an eccentric D.D.

Nowadays, the average foreign merchant in a city knows all the important Chinese of the place. He knows the merchants, the officials, the professional men and many of their wives. He dines at their houses and invites them to his. It is true that the clubs are still closed to natives, but in a city like Shanghai, the Union Club and the American University Club are jointly American, British and Chinese, and all get along well together. A large number of foreigners know some dialect of the Chinese language and every foreign chamber of commerce either conducts language classes or encourages novices to study the language.

Sons of Chinese officials and merchants visit foreign countries and get to have an insight into the customs of the place. Recently Mr. Cheang Koon-chi, the son of Mr. Cheang Park-chew, the most important Chinese in the tobacco business, visited every important tobacco country in the world. No foreigner can put anything over on him with regard to tobacco, simply because he is a foreigner. Mr. Chang Chien, Jr., son of China's largest cotton magnate, is doing the same thing with regard to cotton at this moment. Every year thousands of Chinese study at American, British, German and French universities and a few thousand more travel as tourists.

The first thing that the Chinese learn is that the really big men of the country stay at home. That is, that the sabre-rattling, desk-banging, noisy colossus in Shanghai or Peking is a very small fry in Washington, London or Paris. The Chinese try to get to know the big men at home. They find out what America, Britain and France really think about China, and they get their knowledge first hand. When the legations at Peking make a noise, the Chinese send out an S.O.S. to find out what the press of the various countries have to say, what Wall and Lombard Streets think, how the chancelleries are reacting. When the American chamber of commerce of Shanghai passed a powerful, strong arm, big-stick resolution, the Chinese knew beforehand that Washington would have none of it. They are changing because they know our ways.

One of the first things to affect Chinese ideas of foreigners was the war. All foreigners used to look alike to the Chinese. Then the war came and the Allies and the Germans got calling each other names and the Chinese believed them both. The Chinese attitude was that when thieves fall out the truth comes out. They took it for granted that the Germans knew the Allies better than the Chinese did, and that the Allies knew the Germans better than the Chinese did. They bowed to superior knowledge. Then came the Russian revolution and the Chinese heard all about the Russians. They were told not so much that the Russians were red but that they were scallawags and they hoped it was true. But they also heard what the Russians had to say about the rest of the world. This cussing all over the place did the foreigners no good in China. It simply confirmed the opinion of the Chinese that all the foreigners were indifferently bad.

Before the war, the Chinese had an ungodly fear and respect for German militarism. Here was a machine that would meet all comers and hand out knock-outs with the rapidity of a "Big Bertha." But the machine caved in and when the war was over, the Allies forced China to deport all Germans. The Chinese deported the Germans, seized their property, grabbed back concessions, abolished extraterritoriality and eventually got back Shantung. When it was all over, the foreigners just began to realize that they had taught the Chinese to get back their own and that there was no telling where the getting would stop. In a word, the foreigners had set in motion all the forces for an abolition of the extra privileges which the foreigners enjoy and want to hold.

They did the same to the Russians. But that is a much more serious problem because in Harbin alone there are perhaps 75,000 of them. When an Italian was once arrested in Harbin and treated roughly by the Chinese police, the latter apologized to the Italian consul explaining that they thought he was a Russian. Russians anywhere in China are having a very hard time, and the Chinese themselves wonder why they don't go home. In the old days, all foreigners were rich, except beach-combers and they were taken care of by their consuls. Nowadays, thousands of Russian refugees are starving in China, eating the bread of Chinese charity, and, in many instances, competing with Chinese coolies for jobs. The Chinese face facts and believe that the mighty white race has fallen. They are taking advantage of the situation as advantage was taken of them.

In the old days, any breach of peace was followed by at least a naval exhibition of power. Usually an indemnity was demanded and China had to pay. When she had no money, which was usual, she was told where to borrow and under what conditions. Soon, however, foreign trade got to be more important than vested interests. The foreigners were more careful to offend Chinese public opinion because it might hurt their trade interests. The Chinese quickly took advantage of the situation and utilized the boycott to enforce their will upon foreigners. They succeeded with the Japanese and taught all foreigners discretion.

China has a large number of treaties with foreign nations. These treaties are all unfavorable to China, that is, they give to foreigners rights which the Chinese do not enjoy in foreign countries and which are unusual, such as extraterritorality, lack of tariff autonomy, concessions, etc. These treaties China has to abide by, but the question often arises as to interpretation. Often there is a discrepancy between the English or French version and the Chinese version. Since the American Returned Students have come into power in the ministry of foreign affairs, there has been a tendency to interpret treaties more strictly, whenever a strict interpretation helps China, and to admit that the Peking government cannot enforce its will on the provinces whenever the provinces ignore the treaties.

An example of the latter is the Cigarette Tax Chekiang province levied; a 20 per cent. tax on cigarettes in addition to taxes already paid to the Central government, which is a contravention of the treaty. When the Legations protested they learned that Chekiang was temporarily independent of Peking and that the tax would be abolished as soon as Peking got control—an inference that the legations ought to help Peking out with a fat loan. Meanwhile, other provinces saw that Chekiang was making some extra money and they tried the same dodge. Most of the provinces faithful to the Peking government, including those under Tsao Kun* and Wu Pei-fu, who dominate Peking, have instituted a cigarette tax. But Peking still replies to protests suavely; Peking still talks about the independence of Chekiang. Wellington Koo is the master of this sort of diplomacy: that is the only reason for his importance to Peking.

During the war, China sent a coolie corps to France and Russia. These countries do not suffer much from color prejudice. The coolies returned, telling wondrous tales of good times in both countries. Their pornographic yarns have not heightened China's regard for foreigners. The Chinese had always thought that those

*Tsao Kun has become president of China.

things were not done. Later, every treaty port had its quota of Russian prostitutes and in Manchuria, many Russian women became the concubines of Chinese officials and merchants. In Shanghai dance halls, some Chinese young blades amused themselves with Russian women and bought them champagne. Stories of their goings-on went the rounds in Chinese circles and seriously lowered their regard for foreigners. Most of the coolies returned from France came from the interior places in Shantung and the Chinese there, who see few foreigners, heard stories, true and untrue, which did the foreigner in China little good.

The anti-Japanese boycott in 1919 was a nationalist movement. Lead by the student element, it was designed to indicate China's ability to prevent further foreign aggression by an economic weapon. Foreigners, particularly British and Americans, sympathized with the aims of the students and assisted them whenever possible. Every American organization in China passed resolutions against the Versailles treaty with regard to its Shantung provisions. The Chinese won. The effect of their victory was to indicate the effectiveness of this weapon and to encourage its use against all who opposed the will of China.

Furthermore, the ruling classes and militarists came to regard this weapon as an instrument for diverting attention from internal politics to international relations. The anti-Japanese boycott of 1923 was just such a tool. The Chihli faction, desiring to elect Tsao Kun, President of China, and realizing that the people of China on the whole were opposed to him, started the boycott movement on the dead issue of the Japanese hold on the Liaotung peninsula in South Manchuria. The boycott was effective in Chihli province and the upper Yangtze Valley where the Chihli party is in power. In Shanghai and South China it was hardly known. This is a dangerous business, because it is not always Japan that is unpopular. Recently the British and Americans were bordering on unpopularity because of the Lincheng note and the demand for foreign supervision of the railway police. When the Chinese were boycotting the Japanese, it was a joke. It might not always be such a joke.

In all of these questions the innate conservatism of the Chinese is naturally a factor. But Chinese conservatism is not a matter of the elders trying to keep the young within a traditional range of vision. It is rather a racial desire to maintain itself. Chinese conservatism, for instance, is not anti-foreign. Until the Spanish and Portuguese came to this country with their utter disregard for the home traditions of the Chinese people and an assertion of superiority which never fit the facts, the Chinese welcomed foreigners, gave them jobs in the government, and, it is safe to say, although the facts are not easily verifiable, permitted them to marry Chinese wives.

At Ningpo, the first western European foreigners to come to China, outraged every law of decency and frightened the Chinese into the belief that Europeans were all pigs and barbarians. Their conduct toward women, in particular, produced a most unfavorable impression upon the Chinese. It should be noted that at Lincheng and Paotzeku, the bandits never molested a woman physically; that in spite of the insufficiency of wearing apparel and the utter helplessness of the women, there was no rape, no indecency, no emphasis on sex, such as usually accompanies, for instance, a western army of invasion. When this characteristic of the Chinese is understood, the attitude of the Chinese toward the first settlers is easily understood. For these Spaniards and Portuguese and Dutch carried off Chinese women to their ships and kept them there; they misbehaved in a manner despicable even to a Chinese bandit.

Naturally the Chinese shut their doors to foreigners. They could not be expected to differentiate between one Frank and another. They were all westerners and many red-headed ones. This attitude the foreigners have learned to term the conservatism of the Chinese. Actually, it is a racial experience, a racial fear of what might happen from too close personal contact. But the Chinese have not put up a fight against the education of women such as the West experienced. They have not opposed schools for women as they were opposed in many western countries. They have not opposed the modern factory system, the industrialization of production, as it was opposed in western countries upon the introduction of the steam engine. Only in the upper reaches of the Yangtze where the steam-boat is replacing the Chinese junk is there a conflict over a modern machine. In the cotton industry, the silk filature, the iron and steel industry, mining, flour milling, rice milling, even agriculture, is progress among the Chinese more rapid than it was in western Europe. That is, the Chinese have only come to know modern methods within two or three decades and they are accepting new methods already, while in the West, it took centuries of argument and agitation to convince the conservative-minded that the world moves.

Instead of being conservative, the Chinese are actually a most adaptable people. They lack national efficiency it is true, and therefore their roads are poor, but the Good Roads Movement for China commenced its career in 1921 and already there are good roads in every province. Some day the Chinese will learn that the mere building of a road is not sufficient, that a road must be well-maintained; that the mere erection of a cotton mill is not good business, that it has to be well-financed and administered; that the mere desire to modernize is not progress, that modernization must be on a basis beneficial to the country. But the failures of the Chinese are not an indication of conservatism. Rather are they indications of the inability of the Chinese to imitate; of the necessity for Chinese to study and assimilate rather than to study and to copy like the Japanese.

In the changing attitude of the Chinese toward the foreigners this so-called, misunderstood conservatism is a great factor. The Chinese themselves are learning rapidly that they cannot mimic the West, that they have to produce something of their own. This leads to a movement away from foreign things. For instance, in the matter of dress: immediately after the revolution, eleven years ago, all the young men took to foreign clothes and some adopted foreign surnames. The clothes proved, to many of them, ungainly and uncomfortable because the lack of physical exercise makes the Chinese body less sightly than that of a western football star and the cut of foreign clothes brings out the round shoulders and the pigeon chested breasts, while Chinese clothes serves to hide all defects. Also the heating arrangements in Chinese houses, ventilation, decorations, etc., make a Chinese both uncomfortable and incongruous in a Norfolk suit and a tweed hat. He looks foolish.

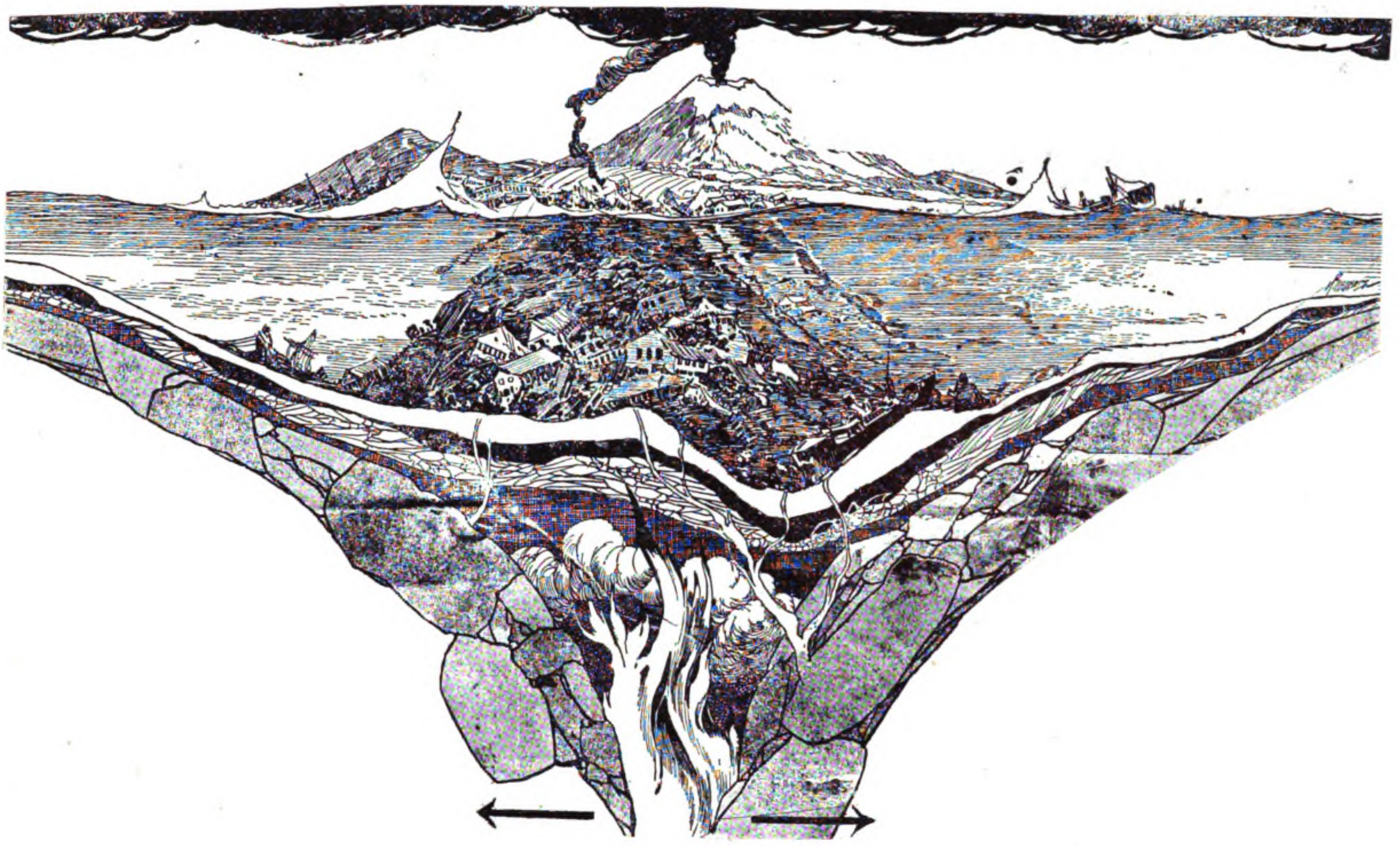
The foreign surname is indescribably stupid; James Lew, John Tang, Wellington Yang, Luther Chang, sound as ridiculous to a foreigner in China as to Chinese. It is one of these things which hits the ear wrong like a Richard Strauss attempt to discover a discord. The same thing is perhaps true in America when a radical names his first-born Karl Marx Lenin Huxley Smith. The poor kid has no chance in life until a genius comes along and nicknames him "Buddy."

The reaction against these foreignized tricks is very great at the present time. Young Chinese are dropping discordant names, are wearing harmonious clothes, are reading and writing in Chinese. They are going back to China. Many foreigners regard this movement unfavorably. But those who understand China can see in this tendency nothing but good, since it is developing a national consciousness, a desire to understand the people and the country and a will to serve both. In the Christian movement in China this tendency is particularly noticeable. Chinese are wearying of the noneclature which makes a man a Presbyterian or a Baptist of a Methodist. They particularly dislike the distinctions growing out of the American Civil War which have nothing to do with China, like northern Baptist and Southern Methodist, etc. Either they are followers of Christ or they are not. The result has been a China for Christ movement in which the Chinese Christians demand a union of all sects and groups and a predominance of Chinese authority in the councils of the church. This movement is in its third year and is fast becoming one of the outstanding features of the religious world in China.

This self-assertion of the Chinese, this insistence upon things Chinese expresses itself even more definitely in the officialdom. In the old days, Chinese officials bowed their heads to foreigners and then double-crossed them, This was called high diplomacy and adepts in it like Li Hung-chang, Yuan Shih-kai or the younger men still in the Foreign Office in Peking, built up great careers upon their ability in this direction. The younger Chinese officials, particularly those in the provinces, dislike this method of dealing with foreigners, preferring to talk straight from the shoulder. Sometimes their talk is all bunk like the brilliant outpourings of the Chinese Chargé d'Affaires in London on the opium question or the notes of Mr. Wellington Koo to the Diplomatic Corps in Peking. But in the interior, particularly in the provincial capitals, much is said which it would be well for the foreigners to listen to.

Foreigners call this self-assertiveness. They say that in the good old days, Chinese would not dare to use strong language

(*Continued on page 50*)



"The Mystery of Continental Blocks Which May Obliterate Japan"

THE recurrence of severe earthquakes in central Japan so shortly after the calamity and series of shocks of September last, will provide scientists with fresh material upon which to base new theories as to their origin. Seismic experts are limited to a very small group whose theories do not always harmonize. The great disaster of September provided the occasion for every scientist, embryo expert and alarmist to get their ideas before the public and from the huge mass of literature on the subject one explanation alone seems most plausible.

Japan is merely the summit of a volcanic mountain chain off the coast of the mainland of Asia. The base of the mountains lies five miles beneath the ocean in the Tuscarora Deep, a great depression in the floor of the sea extending along the coast of Kamchatka, the Kurile Islands and Japan. Within ten miles of the shore of the eastern peninsula inclosing the Tokio harbor the bottom of the ocean is two miles below the surface, and the depth of more than 4,000 fathoms is reached within about twenty-five miles.

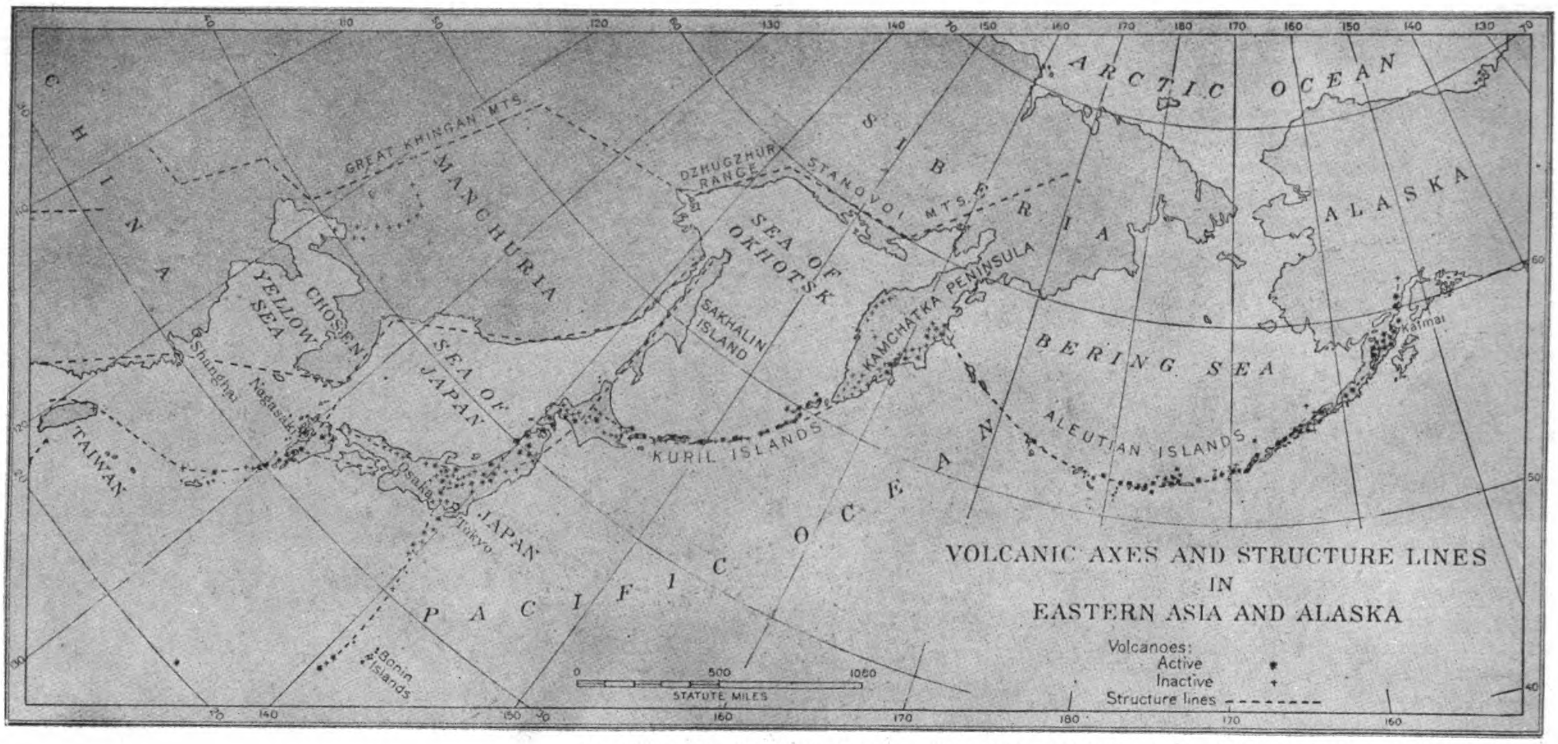
There is doubtless a geologic fault in this Tuscarora Deep just as there is a geologic fault on the Pacific coast of the United States. It was the slipping of the rocks in this American fault that caused the San Francisco earthquake. There are plausible reasons for believing that it is the continual slipping of the rocks in the Tuscarora fault and the consequent setting of the earth that is responsible for the recurrence of earthquakes in Japan.

One expert says that the upheaval in Japan must have come from leakage of sea water in contact with molten rock, under the tremendous pressure of many thousands of feet of water. The idea seems to be that the water pours through the ocean's leaky bottom, thereby coming into contact with hot rocks and turning to steam whose tremendous pressure starts volcanic action and big earth movements.

This theory seems reasonable. All natural phenomena must have natural causes. We know that water in contact with hot surfaces will produce steam and we know of no other cause which we can conceive as able to produce such tremendous results. Volcanoes seem to be safety valves. In Japan, apparently, there was an accumulation of force not connected with any neighboring volcano and hence the awful results to a dense population.

This theory, however, is refuted by other scientists who maintain that anyone who has a commonsense knowledge of water pressure would understand that the ocean cannot leak out through its bottom. The land is higher than the sea. Land water drains into the sea, aboveground and underground. The pressure of a column of water is determined not by its volume but by its height. Anybody who has ever seen a well dug knows that the earth is full of water and that the underground water pressure spreads everywhere through the rock. Thus the ocean water pressing on the bottom should be counterbalanced by water pressure from below. True, salt water is heavier than fresh water. But most of the deep water underground is salt, and there is nearly always additional pressure due to the higher source of the underground water, in the land above sea level.

Thus, if there is a hole in the bottom of the sea, we should expect water to leak, up through it, rather than down, just as it does in the bottom of a boat. And this is exactly what sailors often do find—springs pouring up from the sea bottom, some of them salt and some fresh.



Reproduced from the National Geographic Society's Publication, "The Valley of Ten Thousand Smokes"

MAP SHOWING WHY JAPAN IS SUBJECT TO FREQUENT DESTRUCTIVE EARTHQUAKES

Japan is not only the scene of many earthquakes, but the island kingdom is literally "peppered" with active and inactive volcanoes (indicated respectively by stars and crosses). Yet volcanic eruptions and earthquakes are not interdependent. The quakes caused by volcanic disturbance, while sometimes of extreme violence, are seldom if ever widespread. It is significant to note that more than half of all the earthquakes that have occurred in Japan since careful records have been kept have originated in the ocean deep to the east of the islands.

The crust of the earth is much wrinkled and broken, and the folding and faulting accompanying this process are greatest along the boundary lines between elevated and depressed segments, developing cracks. Such folding is seen in the curving mountain ranges of Japan, while offshore is one of the deepest "deeps" in the whole ocean, suggesting that one block of the crust has slipped over the next and pushed it down. Next outside the island festoons of Japan is the scalloped coast line itself. Beyond that is another series, including the remarkable escarpment of eastern Manchuria—the Great Khingan Mountains, the dominating geographic feature of the entire region.

A St. Louis scientist puts forth the suggestion that the digging of the Chicago drainage canal was responsible for the disastrous earthquake in Japan, the contention being that the canal from Lake Michigan to the Mississippi River was the means of diverting an abnormal quantity of water from the lake through the river to the Gulf of Mexico, thus changing the balance on the earth's surface. The line of reasoning is a little too deep for us, and we are perfectly willing to let it go at that.

There is another group of serious European scientists of established reputation who have devoted their lives to a careful examination of geological and astronomical evidence.

This group includes such investigators as Dr. Max Valier, of Munich ; Engineer Hanns Hoerbiger, of Vienna ; Dr. Voight, of Berlin, and Professor F. Queisser, of Prague. Of their latest researches, carried on with the daring born of scientific accuracy and a cosmic largeness or vision, Dr. Valier is the spokesman. In his publications, lectures and interviews, he emphasizes always the necessity for ridding our minds of our current notions respecting the solidity, motionlessness and safety of the earth. One cannot, says Dr. Valier, awaken a man's perception to the undeniable fact, for instance, that the space through which the earth is rushing at the rate of thousands of miles per second is filled with gigantic, invisible blocks of ice, before he has learned to view the earth as the insignicant little speck of dust it really is, when compared to the colossal dimensions of the celestial system of which it is a minute part.

How will this perlious situation end ?

To this burning query our scientists provide four answers—all of them are correct. We shall be overwhelmed by the internal fires of the earth ; our water will either give out or overwhelm us completely in a second Noah's flood from which no one will escape ; our air will give out or become posioned ; we shall collide with another heavenly body. All of these things will eventually happen, says Dr. Valier. The only question is, which catastrophe will first have the honor of terminating the existence of man ?

Now comes Professor L. Kober, a famous German geologist, with another ordinary contribution to science, in the form of a theory which seems to explain the exact causes of the great upheaval in Japan, and at the same time to shed a startling new light upon the general structure of the earth crust upon which we live.

Two phases of the theory which are of really thrilling human interest are these :

First, that Japan is in an exceptional danger zone, wholly different, for instance, from San Francisco and Southern Italy, and that Japan may some day suffer the fate of the mysterious lost Atlantis and be completely engulfed in a combination of earthquake and tidal wave.

Second, that the earthquake zones of America, which are chiefly the Pacific coast and the Atlantic coast near Charleston, South Carolina, are protected in such a way that a like misfortune will probably never happen to them.

How can science read the future to that extent ? The answer is : Partly by studying the past, and partly by daring speculation—but speculation which has a big chance of being right because it is based on accurate reasoning.

The globe on which we live consists of a more or less hot central core and an outside cold envelope or crust. Ever since the earth has possessed this rock envelope, nature has been engaged in spasmodic efforts to fit it about a constantly cooling and shrinking interior, and, as Jacques W. Redway, F.R.G.S., points out, "thereby hangs the tale of the jars and tremors which tradition calls earthquakes.

"Little by little the interior of the earth is losing its heat ; hence it is shrinking in size. But the rock envelope must fit itself closely around the shrinking interior, and by this process wrinkles and folds are formed.

"The great mountain chains are the wrinkles of the earth's rock envelope," and it is along these wrinkles, or near them, that the crumpling and breakings known as earthquakes generally occur."

All this has been already known. But now comes Professor Kober's theory, adding new material to it.

He believes, in brief, that he has discovered that the earth's crust is made up to-day of a great number of irregular solid blocks—some almost as big as a continent or ocean—and that in the body of

these continental blocks there can be little or no breaking up or earthquakes. He believes that these great blocks are separated by plastic—that is, softer—zones. These plastic zones, of course, are earth and rock, too, but not as firmly knitted together as the blocks.

What he believes happens is this : As the earth cools inside, two of the great blocks move slowly toward each other. They press against the plastic zone between. As pressure increases, the plastic zone buckles, either upward or downward, or both, and from this movement you have wrinkles and breaks in the earth's surface—mountains, earthquakes and other irregularities.

Professor O. H. T. Rishbeth, of Southampton University, outlining this part of the Kober theory in the British scientific journal, " Discovery," says :

" As the earth contracts, the blocks are brought closer together. By their nature and position they have little choice of movement. At first, they will draw together in one and the same horizontal plane. They are the active agents, exerting pressure. The brunt of their onsets must be borne by the plastic zones. These plastic zones one must think of a first as in their hollow stage (like the ocean floor around Japan), sea-filled and having their floors probably weighted by vast masses of rock. As pressure continues, this floor bulges and buckles."

As this continues there finally comes sometimes a great smash, under strain, and the result in the case of the late Japanese earthquakes is that whole cities are destroyed and more than a million people killed.

Never indeed, in known history, has there been such a smash as this one—unless we accept the disappearance of the lost continent of Atlantis, which is described only in legends.

The classic tragedies of Pompeii and Herculaneum in 79 A.D. were slight compared with the fate of Tokio and Yokohama. Pompeii had a population of only 20,000, and the loss of life was only about 2,000. Herculaneum was a mere suburb of Pompeii, and had less than 1,000 dead.

Professor Kober's map of earthquake danger zones shows that Japan, being detached from any great solid, continental block, could conceivably disappear completely under the ocean as the result of an even greater cataclysm than that which occurred.

In considering the geologic possibility of such an ultimate fate for Japan, it is interesting to note that another such detached earthquake zone occurs in the Atlantic Ocean a few hundred miles west of Gibraltar off the Spanish and African coasts, in exactly the spot where the ancient writers say the lost continent of Atlantis once existed.

Plato mentions Atlantis, and it was believed in his time to have disappeared by an earthquake like that which recently shook Japan, but even more tremendous in force. He says :

" This Atlantis was a continent lying over against the Pillars of Hercules (modern Gibraltar), in extent greater than Libya and Asia (minor) put together, and was the passage to other islands and toward another continent (possibly America). This mighty power was once arrayed against Egypt and Greece and all the other countries bordering on the Mediterranean. Then did Athens bravely, and won renown over the whole earth. For at the peril of her own existence she repelled the invader. A little while afterward there was a great earthquake and the warrior race all sank into the earth, and the great island of Atlantis also disappeared into the deep sea."

Many modern scientific writers have believed that this lost Atlantis, about which so many romances have been written, was wholly mythical, but in the light of the Kober theory of earth blocks and earth structure, it is quite likely that it may have existed and disappeared in much the manner described by the ancinets, and that other modern islands and island continents, in similar zones may in time suffer a like fate.

* * *

Chinese Knitting Factories

SEVERAL interesting points in connection with the Chinese knit goods industry have been brought out in a report to the bureau of foreign and domestic commerce made by Assistant Trade Commissioner A. Viola Smith, who is stationed in Shanghai. One of them is that a Chinese laundryman, returning from the United States to China, introduced the idea of modern power-knitting machinery into the country.

Returned students have been responsible for the growth of a demand for underwear of the " athletic " type, and one of these students is credited with being the pioneer manufacturer of knitted underwear involving the use of the Dobby loom. The laundryman is regarded as the father of the machine knitting of hosiery in China, and this branch of the knit goods industry is a great deal more important at present than the attention given to the production of underwear.

Of the four standard styles of hosiery manufactured in China, the most curious is the " bound foot " sock, which is worn by Chinese women with tiny feet that resulted from the old foot-binding custom. This practice is now prohibited, according to Miss Smith, but it is still seen in parts of the interior. The toe of this sock, or half hose, is very sharp, and is usually sewed into shape. It is sometimes made by picking the needles more than half-way around, and sometimes by being ironed out.

By far the most popular style of hosiery in China is the common type of half hose, which is worn both by men and women. Sizes run from eight to ten. The Chinese foot is much smaller than the foreigner's foot generally, and for this reason small sizes are the better sellers. Sizes nine and nine and one-half fit the average Chinese foot. The so-called extension sock is similar to the common half hose, but has an extended leg that ends in a welt instead of a rib. This style is chiefly worn by Chinese women. The fourth standard style made is the regular type of women's stocking, although the leg is usually found to be short for foreign wearers.

No full-fashioned lines are produced in China, according to Miss Smith. The output is confined entirely to seamless hose, although Shanghai mills recently have turned out a boarded stocking, which has later been stitched in the back to produce a mock-seam effect. Such hosiery retains its shape after laundering better than the seamless boarded hose, but it produces an ill-fitting heel and too tight a leg for the foreign trade.

" There are to-day scattered throughout China numerous hosiery and knitting mills, both hand and power driven, but the centre of the modern power-mill industry is located in Shanghai in Kiangsu province. The two largest hosiery mills were established in 1915. Both are located in Shanghai, and each is equipped with about 200 power-driven modern American machines. They are turning out various classes of hosiery and are working to full capacity. One of them is reported to have an output of 1,000 dozen pairs per day of ten hours.

" The production of these mills is chiefly consumed by the Chinese population, although there is a large volume purchased by the foreign element, owing to the cheapness in price. The men's half hose is more satisfactory to the foreign trade than are the ladies' stockings. Chinese hosiery products have been exported to India, Manila, Singapore, Australia and Antwerp."

Miss Smith adds that the vast population of China does not constitute a market for foreign hosiery, nor does it promise to in years to come. The import trade is virtually confined to the foreign population in the treaty ports. Cheap grades of imported hosiery have very little chance of competing with the native product, as the Chinese goods are usually found to be superior to the cheap lines of foreign hose that may be found available.

" Native underwear mills have not grown to the proportions in China that the modern hosiery mills have," Miss Smith continues in her report. "This is due, perhaps, to the fact that the Chinese have had little or no appreciation of foreign-style knit underwear. For centuries they have worn a two-piece pajama-like suit cut in a typical Chinese style, which has been made of various grades and styles of cotton cloth. Coping with the changes in the rise and fall of the thermometer has to them merely meant the putting on or taking off of additional coats and pants. However, a few Chinese mills are turning out knitted singlets—a low-neck, no-sleeve, fine-rib vest—principally worn by Chinese men. A two-piece suit also is made along the lines of a Chinese garment.

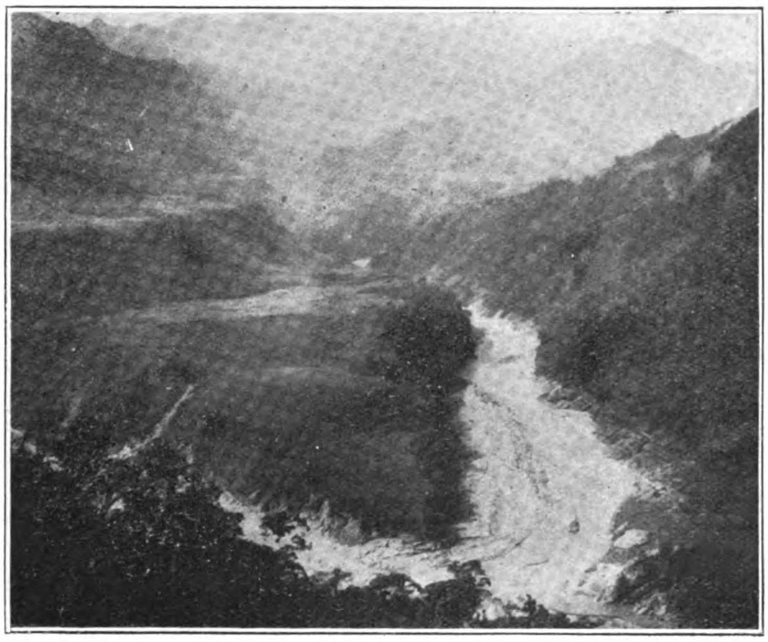
" The principal underwear mill in China is located in Shanghai. It was established in 1921 by a returned student, who is reported to have imported the first Dobby looms into the country. This mill produces four styles of underwear and has a capacity of about 3,000 pieces a day."

Administration By Electricity

By Owen Rutter, F.R.G.S., F.R.A.I., Author of "British North Borneo"

WHEN China ceded the island of Formosa to Japan in 1895, the Japanese found themselves confronted with many problems. One, and not the least important, was the settlement of the pagan tribes which inhabited the greater portion of the Eastern highlands. These people, who, for want of a better word, may be called the aborigines of Formosa, have probably been in the island for at least 20,000 years. Their origin is almost certainly from the north-west mainland of Asia and they are mainly of Indonesian stock (being curiously akin to the tribes of Upper Burma and of Borneo) although there are also Polynesian traces amongst them. Before the coming of the Chinese to Formosa they were in possession of the fertile plains which form the western half of the island, and only took to the hills at a later day as a refuge from the persecutions of the new settlers.

The Chinese treated the aborigines with every conceivable barbarity; they oppressed them, they misgoverned them, they took their lands, stole their property, and even ate and traded in the flesh of those whom, on one pretext or another, they had killed.* There arose between the two peoples a bitter enmity which lasted through the centuries until the coming of the Japanese, the natives regarding all Chinese as their foes and taking their heads whenever an opportunity occurred.



On the Fringe of the Savage Country.

When the Japanese had put down the bands of Chinese brigands and rebels who roamed the plains, they turned their attention to the aborigines and established along what was known as 'the savage border' a line of guard-houses at strategic points, connecting them by a track cut through the forest, and garrisoning them with detachments of police.

"Where it becomes necessary to perfect the defensive arrangements," says Mr. Takkoshi in *Japanese Rule in Formosa*, "wire entanglements, *charged with electricity*, are used or mines are run. These have a great effect in giving an alarm of the invading savages. In certain important places mountain or field guns are placed. One gun is sufficient to withstand the attack of several tribes." The italics are mine.

This guard line is in force to-day. At intervals the line is advanced, either by means of military expeditions or, more rarely, by arrangement with the inhabitants. The natives who thus come under Japanese influence are then 'tamed' and educated, being taught to speak Japanese and generally 'assimilated.' When the advance of the guard line is opposed a guerilla warfare ensues, in which the native warrior, at home in his own country of jungle hills, has a great advantage over the heavily equipped Japanese soldier, who is unused to jungle work or to climbing hills.

Hitherto these methods have not been successful in settling the aborigines to any great extent, as the Japanese admit. This lack of success is, for Japan, a very serious matter. She does not possess so much superfluous territory that she can allow 100,000 pagans to keep her out of 7,000 square miles of country which, besides allowing for ample native reserves, could support a thriving agricultural population, to say nothing of its vast stands of valuable camphor trees and its possible mineral wealth.

Yet this is the position in Formosa to-day: the Japanese are defied by the native tribes, and inside the electrified barbed wire entanglement with which they have surrounded these children of the forest they can only venture with their lives in their hands. It is a humiliating position.

(Continued on page 49)

* See J. H. Davidson's The Island of Formosa, p. 255.

The Formosan Hills

A Native Village.

Wusih, a "Small Shanghai"

By *M. H. Chou, M.S.*

THE development of industries in certain localities in China is governed by many factors. Among them the most important are that the location is easily accessible to the centre of market and that the industrial development is hastened by local leadership. For example, some fifty years ago Shanghai was just a marsh place. Due to its fine location accessible to water, it has become the centre of international commerce. Through the industrial leadership of Chang Chien, Nantungchow has become a modern city especially noted for the development of textile industry. Although Soochow is located nearer to Shanghai than Wusih, yet it is not so noted for industrial prosperity as Wusih because the people in Soochow invest money more or less in banking or real estate business. While these in Wusih are more enterprising and advancing in industrial voyage. Among the noted industrial magnates the Hsieh's family and the Yong's family are by far the most distinguished of all.

Mr. Yong is proclaimed as the "Flour King" of China to-day for the output from his mills alone is 50,000 bags per day. Mr. Hsieh Nan-ming is more noted for his silk and cotton business. His latest enterprise is a cement company called theTa Hu Cement Company which is on the way of completion. With the local leadership furnished by Mr. Yong and Mr. Hsieh, Wusih has attained an unparalled industrial prosperity only next to that of Shanghai. It is commonly called the "Small Shanghai."

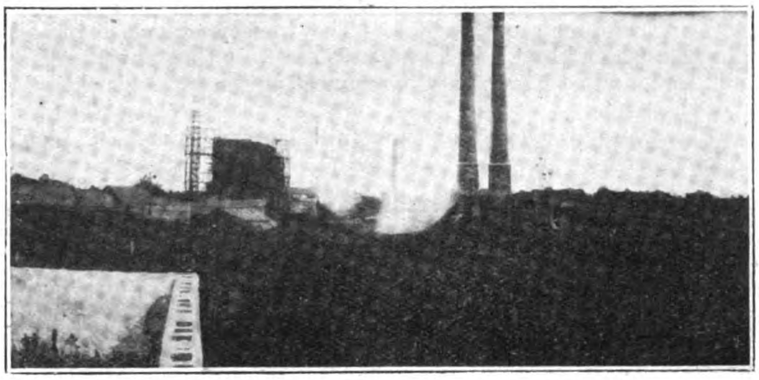
Situated on the Soochow river at a distance of 200 *li* on the Shanghai-Nanking Railroad. There lies the familiar city of Wusih. From time immemorial to a little over twenty years ago, Wusih is entirely an agricultural country. It is inhabitated by a population of 800,000 most of whom are farmers. Rice and silk are the most abundant staples they have raised. With the introduction of machinery from the west and stimulated by the success which has accompanied the foreign cotton mills in Shanghai, the people in Wusih began to start something like modern mills themselves. One mill is springing after another. Wusih at once makes a name for itself as an industrial city.

A brief survey of the industries in Wusih will undoubtedly prove interesting to the Chinese public.

(*a*) *Cotton Mills.*—There are six cotton mills in Wusih, possessing a total sum of 115,000 spindles and 750 power looms. Some of them are using steam ngines as the driving power, while the others are using turbo-generators. The following table will tell the standing of the six mills :—

Name	Date	Capitalization	No. of Spindles
Nieh Gein ...	1899	$ 500,000	13,870
Chung Sing ...	1905	1,800,000	30,330
Kwan Gein ...	1916	800,000	22,000
Shung Sing ...	1921		50,000
Yue Kong ...	1920	800,000	14,000
Ching Foong ...	1921		14,000

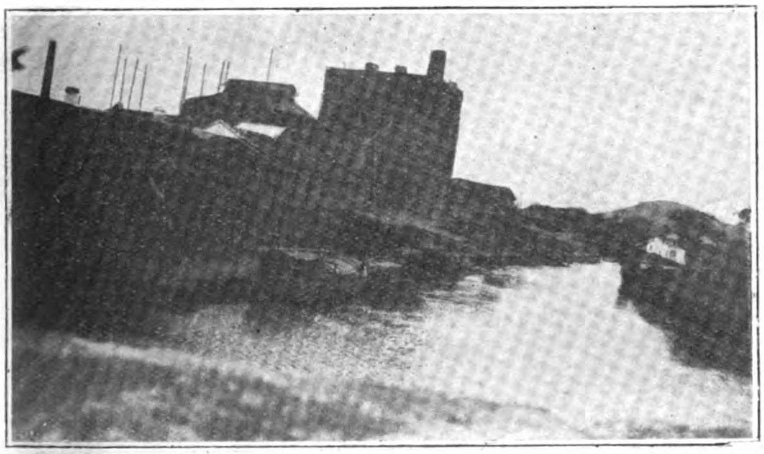
Generator of Power	Consumption of Coal (tons per day)
Steam Engine	9
Turbo-generator 3,000 kw. (German make.)	20
Steam Engine (compound corliss type of English make.)	14
Turbo-generator (American make.) 3,200 kw.	
Steam Engine (English make, not yet in operation.)	
Turbo-generator 1,000 kw. (not yet in operation.)	

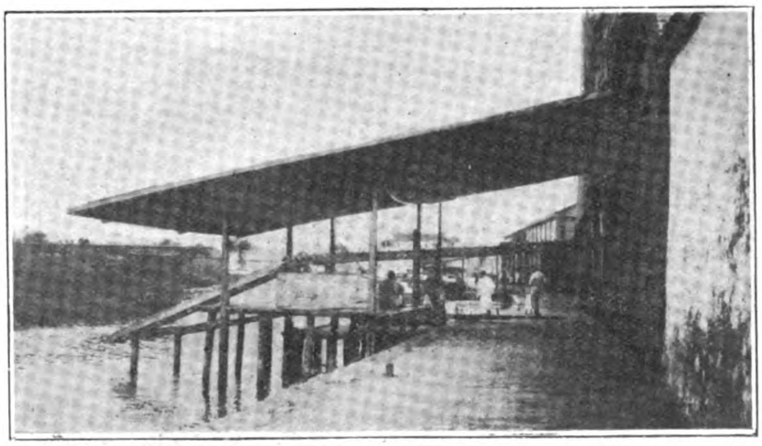


Plant of the Ta Hu Cement Company at Wusih

(*b*) *Silk Filatures.*—There are altogether fifteen silk filatures in Wusih as tabulated as follows:

Name	Yr. Est.	Capital	No. of Reels	Tons of Coal per day
Yue Chang ...	1904	$80,000	330	9
Kien Kee	1907	75,000	314	12
Yuen Kong ...	1907	77,000	320	10
Chung Nieh ...	1908	100,000	520	18
Kein Sung... ...	1908	50,000	208	7
Kein Foong ...	1913	50,000	256	8
Yung Shung ...	1914	52,000	256	8
Zai Chang ...	1914	50,000	248	8
Wah Shung ...	1918	50,000	288	8
Zai Kong Sheng ...	1916	40,000	280	9
Ching Foong ...	1919	50,000	240	6
Yung Chang ...	1919		240	6
Chung Lung ...	1920	42,000	304	7
Tai Fu	1920		208	6
Yung Ji	1920	48,000	240	6

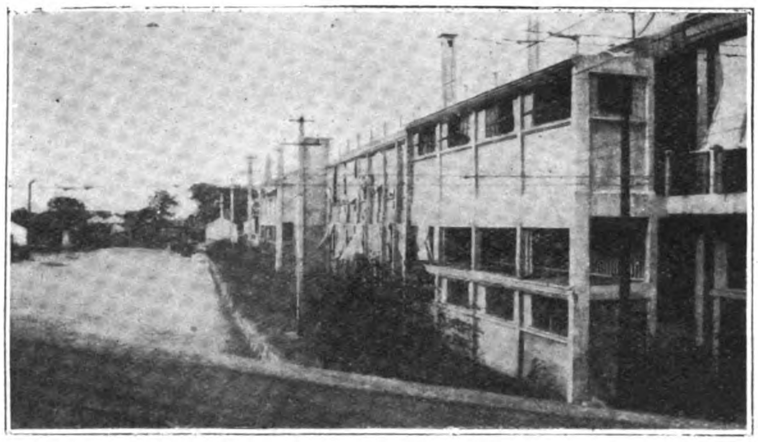


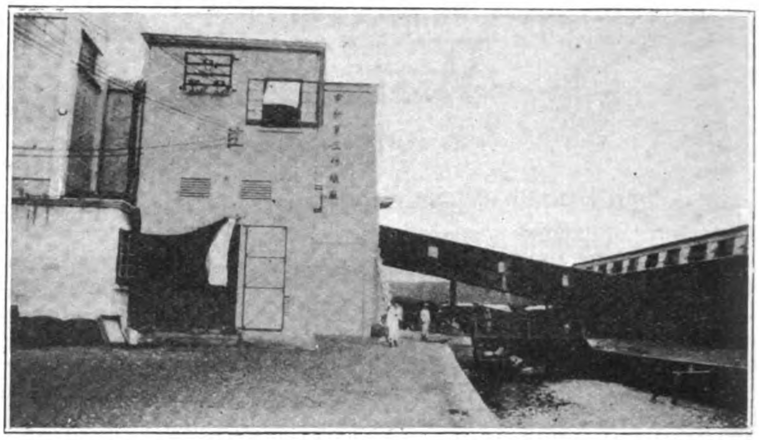


MOW SING FLOUR MILL, WUSIH

General View

Roller Conveyor





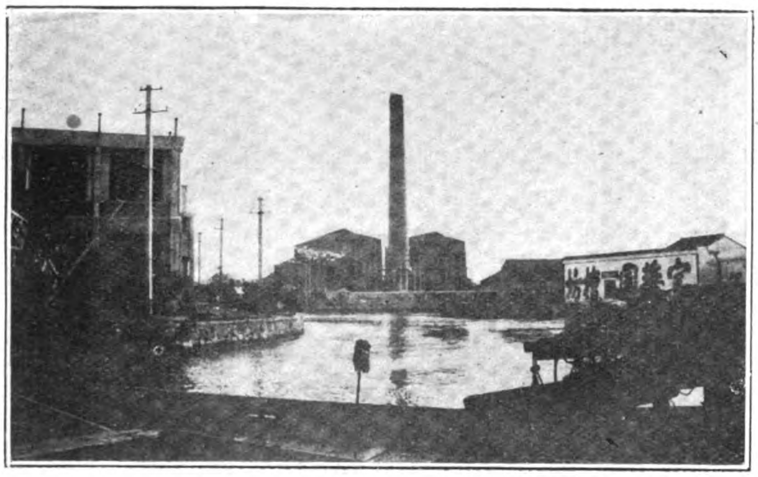
Sung Sing Cotton Mill, No. 3, Wusih

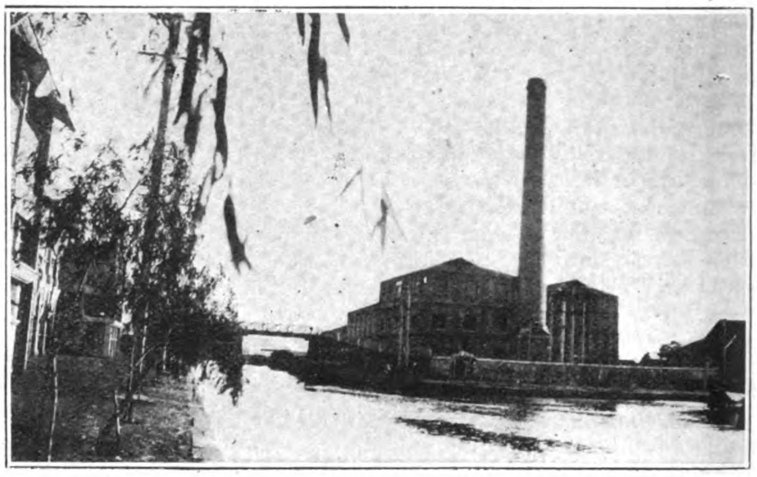
All of them are run by steam engine. Raw cocoons are bought from those hongs where large or small quantities of cocoons are bought directly from the farmers. They are put into boilers and their thread is reeled on the reel run by a shaft to which D. C. generating motors are attached. The workers engaged in silk mill work are children. They have to see to it that any breakage in silk thread must be repaired by connecting the two ends with the aid of the tongs.

The average output of each mill ranges from 2-3½ piculs per day.

coming from the Shung Sing Cotton Mill. The names of the mills with their output are given below :—

Name	Bbls.	Power	H. P.	Tons of coal per day
Mow Sing 1 ...	1,200	Electric	600	
Mow Sing 2 ...	900	,,	500	
Chu Foong ...	1,200	,,	600	26
Chang Foong ...	400	Steam	200	10
Tai Loung ...	400	,,	200	11





Sung Sing Cotton Mill Power Station, Wusih

The coal consumption of these mills averages from 15 to 20 tons.

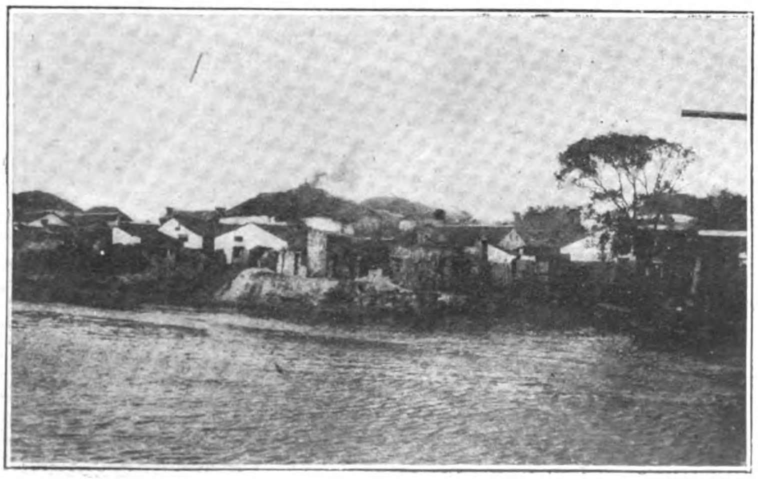
(c) *Flour Mills.*—There are altogether five flour mills which have a capacity of 500,000 bags, each of 50 pounds. The milling machinery is of American make. The power used by the Chu Foong Mill is supplied by the Ching Foong Cotton Mill. Mow Sing No. 1 and No. 2 are driven by the power

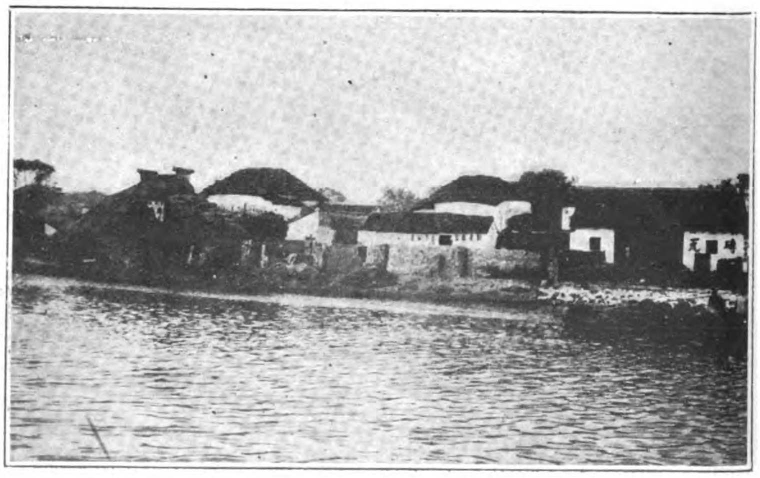
(d) *Oil Mills.*—There are ten oil mills in Wusih, all driven by steam. Their names, capital and output are as follows :

Daily Output.

(*in piculs,* 1 *pic.*=133⅓-*lb.*)

Name	Cakes	Oil	Date	Capital	H.P.	Coal in tons
Shung Foong ...	675	66	1914	$100,000	50	3





Native Brick Kilns, Wusih

Daily Output.

(*in piculs* 1 *pic.*=133⅓-*lb.*)

Name	Cakes	Oil	Date	Capital	H.P.	Coal in tons
Kien Foong ...	563	55	1914	75,000		
Heng Foong Tai	112	11	1914	10,000	10	1
Cheng Mow ...	563	55	1915	75,000	driven by Chen Tai Rice Mill Engine.	
San Hou ...	224	22	1915	30,000		
Tou Yuen ...	248	24	1918	36,000	25	2
Cheng Kong ...	332	33	1919	70,000	30	2
Heng Tuh ...	1,350	135	1919	500,000	100	7
Yuen Tai ...	112	11	1920	10,000	10	1
Yung Foong ...	100	10	1920	10,000	10	1

The Heng Tuh Oil Mill being the largest in Wusih has 100 presses and four crushers all of which are driven by one 100 h.p. steam engine which consumes 6-7 tons of coal a day. Beans are first crushed and ground by two stone crushers driven by a 10 k.w.d.c. generating motor and then subjected to pressing.

(*e*) *Rice Mills.*—There are eleven rice hulling mills in Wusih as follows:

Name	Daily output in piculs.	No. of polishing machine	H. P.	Tons of coal per day
Pao Sing	600	8	50	2½
Yung Ho	300	5	35	1½
Sing Tar	300	4	30	1½
Cheng Tai	300	5	45(drives oil mill at night)	3
Yue Chang	400	6	50	2½
Sheng Chang Yue ...	400	6	35	2
Tuh Yuen	600	8	50	3
Ming Yi	200	3	20	1½
Tuh Sing	200	3	25	1½
Yi Yuen	300	4	30	2
Hung Yi	300	5	35	2

The average rice polishing machine requires about 6-8 h.p. each. These rice mills are in operation only for a period of four months for the year.

Weaving Mills.—There are 16 mills altogether with a total of about 2,500 wooden looms all being operated by hand with the exception of the Lee Sing Mill which is undoubtedly the leading concern in this industry. They have on order from England 200 power looms which will be used to turn out cloth similar to imported piece goods. An Englishman was engaged by this mill for a period of three years with an understanding to teach the Chinese artisans until they are proficient. An oil engine is now installed for drawing two winders. The engine of Chinese make is of 25 h.p. consuming 60-lb. of oil daily and a ¾ k.w. Delco set for 40 lamps is installed for lighting purposes.

Foundries and Machine Shops.—There are five foundries in Wusih all on a small scale with the exception of Kwan Gien.

Yih Gein Foundry and Machine Works has five lathes and one planer. It is driven by a steam engine of four horse-power with a vertical boiler consuming a ton of coal per day. There are about thirty employees engaged by this foundry.

Wei Hing Foundry has three lathes driven by hand.

Soap Works. There are four soap works in Wusih :

Name	Date	Capital	Monthly output boxes	Method of drying	Coal consumption per day
Dah Tung ...	1913	$20,000	3,000	Sunlight	600-lbs.
Kwan Gein ...	1919	10,000	1,200	Steam	1-ton.
Yue Chang ...	1920	10,000	1,200	Sunlight	500-lbs.
Foh Lee... ...	1920	5,000	600	„	200 „

Magnesia Works.—" Chung Hwa Dee Chi Mei Chang," whose finished product is supplied to a tooth powder factory at Shanghai. Daily consumption of coal, about a ton.

Umbrella Works.—Named Ming Sung started in 1919 with a capital of $30,000. The monthly output, 400 dozens, all made by hand.

Brick Factory.—There are two brick works situated about twelve miles away from Wusih. Bricks are made by hand.

Knitting Factories.—There are eleven sock knitting factories all operated by hand except Yeh Sing which employes a 15 h.p. Blackstone oil engine consuming 80-lb. of crude oil every day.

Electric Light Co.—Established in 1907, capacity, 500 k.w., supplying the power to 13,280, 16 c.p. lamps.

Ta Hu Cement Company.—The newest and the bigest industrial achievement added to Wusih is the establishment of the Ta Hu Cement Company, sponsored by Mr. Hsieh Nan-ming and his eldest son Hsieh Hsiuh-chien together with some Wusih and Shanghai merchants. It was started in 1920 and will be completed some time before the first of the year. A detailed description of the factory was published in the March and April issues of THE FAR EASTERN REVIEW for the year of 1923.

Equipment and Operation of the Port of Sabang

(*Continued from page 26.*)

government denies that these works were required in the interest of trade and shipping or if they consider the expenses too high, the decision whether the government will be obliged to take over these works is left to arbitrators. On the other hand if the government desires any extension, which the lease-holders do not wish to execute, then the government has the right to do itself and to operate this harbor work for its own account.

The Company are obliged to operate all the leased harbor works for the use of shipping and trade and to meet all their reasonable requirements.

They also have to provide for pilotage and signal station. This is a great advantage for steamers entering the port, as the manager will know at once all steamer's requirements enabling him to indicate at once the right berth and to make arrangements for the discharge, the coaling and the supply of water and stores, ensuring the quickest despatch.

The mere fact that the port of Sabang has to compete with neighboring ports as Penang, Singapore and Colombo is a guarantee, that wharfage and other expenses will be kept as moderate as possible.

Moreover, Sabang being only an intermediate port of call and not one of ultimate destination, it is evident that the only way to secure business is to keep prices for the supply of bunkers and stores below those of the above named neighboring ports.

Economical management and increased business are therefore the principal means for the Sabang Co. to augment their profits and their endeavors thereto will necessarily lead to the most careful attendance to shipping and to allow their customers all possible facilities.

To conclude it may still be mentioned that in order to ascertain the right fulfilment of the contract with the government there is at Sabang a government harbormaster, who is entitled to inspect the whole establishment, whereas a government commissioner controls the administration and management at the head-office in Amsterdam.

As the above described system of equipment of the harbor as well as the way of operating same have proved to be successful specially during the period of quickly increasing shipping before the war, it has been deemed useful to issue this publication for the general engineers' conference held at Batavia in May 1920.

Wire Manufacturers in Japan Increasing Output

Electric wire manufacturing companies in Japan, which were limiting their production 40 per cent. before the earthquake, are now working full time in order to cover the large demand which has been caused by the restoration work in Tokyo and Yokohama. The Nikko factory of the Furukawa Mining Company (Furukawa Kogyo K. K.), the Hidachi factory of the Kuhara Mining Company (Kukara Kogyo K. K.) and the Sumitomo factories are operated at full capacities. The Honjo and Shinjiku factories of the Fujikura Electric Wire Company (Fujikura Densen K. K.) and the Tokyo Electric Company (Tokyo Densen K. K.), are busily engaged in the restoration of their factories. The Yokohama workers of the Furukawa Mining Company have been transferred to other factories of the Company in Kyushu and Kansai.

Progress of Irrigation in the Philippines

Insular Irrigation Projects

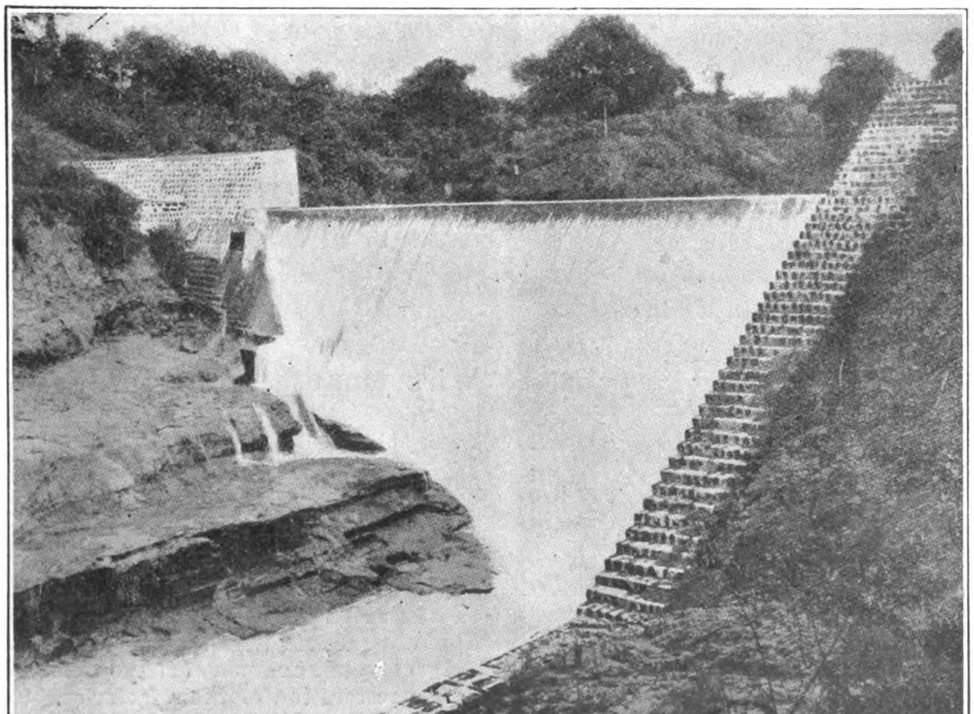
A. D. Williams, Chief Irrigation Engineer

THE irrigation construction program which had been delayed during the latter part of 1921 and the first part of 1922, due to the policy of retrenchment adopted by the government, was actively resumed in April, 1922, upon the release of bond issue funds appropriated by Act 3011, entitled "An act to appropriate the sum of twenty million pesos for the construction of irrigation systems." Funds totaling P.2,300,000 were provided in April for continuing construction work on projects actually under way. Further allotments, amounting to P.1,140,000, were authorized from the same source and for the same purpose in September, making the total of funds provided dring the year, P.3,400,000. This enabled the division to complete the Santa Barbara project in Iloilo province and Dingras project in Ilocos Norte, and also to make very satisfactory progress on the construction of other projects previously authorized. The status of all insular irrigation projects which have been approved for construction since the reorganization of the division in 1918 is given in the following table:—

Project	Province	Irrigable area *Hectares*	Estimated cost	Allotments authorized	Total expenses and liabilities	Percentage of work completed
Trinidad	Mountain	200	P40,000	P40,000	P40,000	Completed (1921).
Santa Barbara	Iloilo	4,986	692,000	692,000	692,000	Completed (1922).
Dingras	Ilocos Norte	1,010	130,000	130,000	130,000	Completed (1922).
Baruyen River	do.	1,000	85,000	81,000	80,292	97 per cent.
Naic...	Cavite	800	300,000	300,000	268,396	92 per cent.
Aganao River	Iloilo	5,500	917,000	917,000	754,765	50 per cent.
Talavera River	Nueva Ecija	10,000	1,028,000	1,028,000	823,312	80 per cent.
Tagudin	Ilocos Sur	1,300	300,000	250,000	162,062	37 per cent.
Amburayan River	La Union	4,500	750,000	619,000	432,347	40 per cent.
Angat River	Bulacan	25,000	4,500,000	2,250,000	2,232,438	22 per cent.
Lamao	Bataan	160	30,000	5,000	3,627	2 per cent.
Laoag-Vintar	Ilocos Norte	6,000	1,000,000	300,000	25,736	1 per cent.
Total	... ...	60,456	9,772,000	6,612,000	5,644,975	

Trinidal Irrigation Project.—This project was completed in January, 1921, and a brief description of same given in the report of this division for the year 1921. The larger part of the land irrigated by the system is owned by the Trinidard Farm School, and, upon completion, the system was turned over to the superintendent of the school for operation and maintenance, in accordance with special authority granted by the secretary of commerce and communications in approving the project for construction.

Santa Barbara Irrigation Project.—Construction work on this project was completed in June, 1922, and water was furnished to landowners under the system for the 1922 rice crop. It was necessary, however, to delay the official opening of the system to December 1, 1922, on account of the work involved in the preparation of a complete list of water users giving the area of irrigable land held by each. The list as prepared shows that the system benefits 733 landowners, or 1,746 separate parcels of land with a total area of 4,985.82 hectares. The irrigation notice covering the completion of the project provides that the annual charge per hectare on said land to cover the costs of construction with interest shall be P.7.01 and that same shall be paid in forty equal annual payments due on or before March first of each year. The estimated annual cost of maintenance and operation is P.2 per hectare, making the total annual charges approximately P.9 per hectare. That the payment of these charges represents an excellent investment for the landowners was well demonstrated by the 1922 rice crop produced under the system. While actual figures are not yet available, it is safe to say that the yield of rice under the system was fully fifty per cent. higher than on unirrigated land in this locality.



Naic Diversion Dam, Cavite Province, P.I.

Dingras Irrigation Project.—Construction work was completed on this project in December, 1922, but water was made available for practically the entire tract of irrigable land in July, 1922, and an excellent crop of rice was harvested. The official opening of the system was held on January first, 1923. There are 2,312 water users under the system who own 5,440 separate parcels of land containing a total area of 1,009.47 hectares. The annual charge per hectare on this land to cover the cost of construction with interest is P.6.50 and the estimated annual cost of maintenance and operation, P.2.50 per hectare, making the total annual charges approximately P.9 per hectare. Payments are to be made by landowners in forty annual installments due on or before March first of each year.

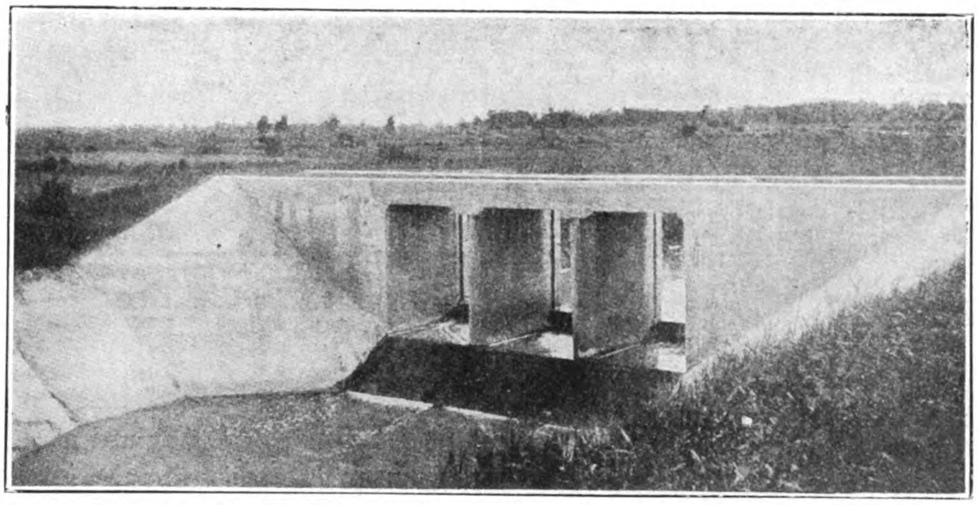
Baruyen River Irrigation Project.—This project, including a cadastral survey of the irrigable land and the preparation of a list of water users was practically completed at the end of the year. The work remaining unfinished consisted of lining a section of the

main canal to prevent the loss of water through seepage and the construction of a small lateral canal. It is expected that this system can be officially opened in March, 1923. The final estimate of cost of P.85,000 exceeds the original estimate by P.4,000, due to the necessity for lining portions of the main canal.

Naic Irrigation Project.—Construction work on this project was taken over by administration from the Manila Engineering Co., the contractors for the masonry dam and canal excavation work, on May 8, 1922, due to unsatifactory progress. Three extensions of time amounting to 288 days had been authorized for the completion of the dam and two extensions, totaling 161 days, for the canal excavation work, making May 31, 1922, the time for completing both contracts. At the time of taking over the work, it was estimated that the dam was approximately 80 per cent. completed, not including necessary extra work, and the canal excavation work was about 45 per cent. completed. It was therefore apparent that the contractors could not complete the work in contract time. It was desired to complete the dam before the heavy rains started, but an early rainy season made it advisable to discontinue construction work on the dam early in July, after the work had been carried by administration to the point where it could be safely left through the rainy season. Construction work on the dam was resumed in November and same should be completed in February, 1923. The canal excavation work and the construction of all canal structures were completed before the end of the year. The system should therefore be ready to deliver water for the next rice crop.

Aganao River Irrigation Project.—The canal excavation work which was performed under contract with the Manila Engineering Co. was completed in October, 1922, they having been granted an extension of time of 70 working days in accordance with the terms of the contract. The diversion works, which are being constructed under contract with the Atlantic, Gulf and Pacific Co. of Manila, were approximately 50 per cent. complete at the end of the year, and at the present very satisfactory rate of progress, the diversion works should be completed in April, 1923. The plans of all canal structures were completed and this bureau advertised for bids in December with a view to completing the entire system in time to furnish water for the 1923 rice crop.

Talavera River Irrigation Project.—Messrs. Martin and Hanna, contractors for the construction of the diversion works and main canal structures, completed all canal structures on contract time, June 30, 1922, but an early rainy season seriously interfered with work on the diversion weir and it was necessary to continue work on same through the rainy season. Extensions of time totaling 90 working days were authorized and the work finally completed and accepted on December 30, 1922. The main canal and a portion of the distribution system having been finished in July, the contractors were required to make provision for diverting water for irrigating approximately 4,000 hectares of land planted to rice during the past season. With the release of P.228,000 required for the completion of this project in September, 1922, the work of completing the distribution system was immediately resumed. It is believed that this work can be finished in time to furnish water to the entire area of 10,000 hectares for the next rice crop and for the official opening of the system by the end of 1923.



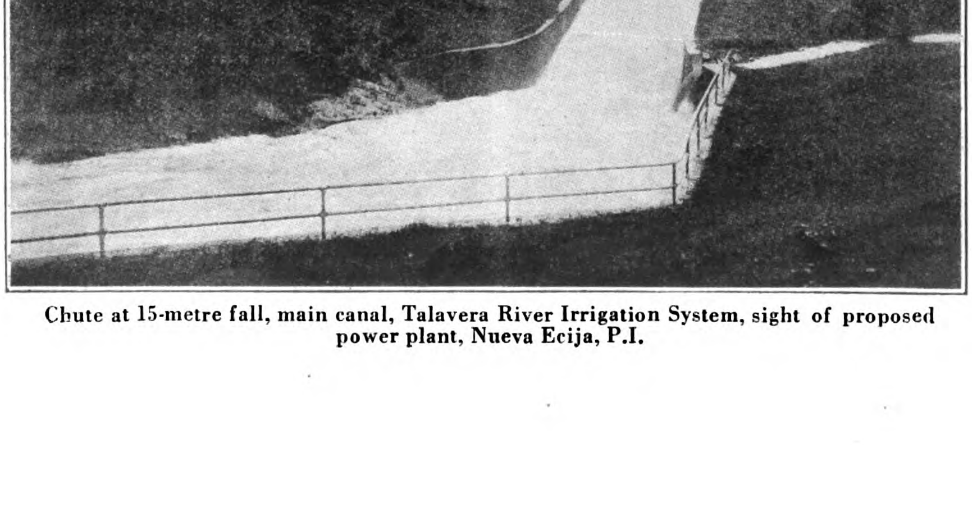
Combination bull cart crossing and drop, main canal, Aganao River Irrigation System, Iloilo, P.I.

Tagudin Irrigation Project.—The work of driving the 1,300-metre diversion tunnel was resumed by administration with the release of funds in May, 1922, all construction work on this project having been shut down in August, 1921, because of lack of funds. Delays on account of the necessity for lining sections of the completed tunnel and from handling the large amount of water encountered during the rainy season interfered with the work of driving the tunnel. Very satisfactory progress was made, however, after the rainy season and it is now planned to complete the project as a whole during the 1924 dry season. A total of 670 lineal metres of the tunnel had been driven at the end of the year, of which 270 metres were driven and 126 metres lined during 1922. The headworks structure is also about 80 per cent. complete.

Amburayan River Irrigation Project.—Construction work on this project, which had been delayed from August, 1921, due to lack of funds, was resumed by administration with the release of additional funds in April, 1922. The work accomplished during the year included the driving of 390 lineal metres of the 750 metre diversion tunnel, excavating 48,000 cubic metres of material from a 5- to 7-metre cut on the main canal, placing 392.5 cubic metres of rubble masonry and concrete in main canal structures and laying 6,450 square metres of rubble paving in the main canal. The work of driving the tunnel is progressing very satisfactorily and should be completed during the present dry season. The main canal including the paving work and the construction of the distribution system will require at least another dry season for completion.

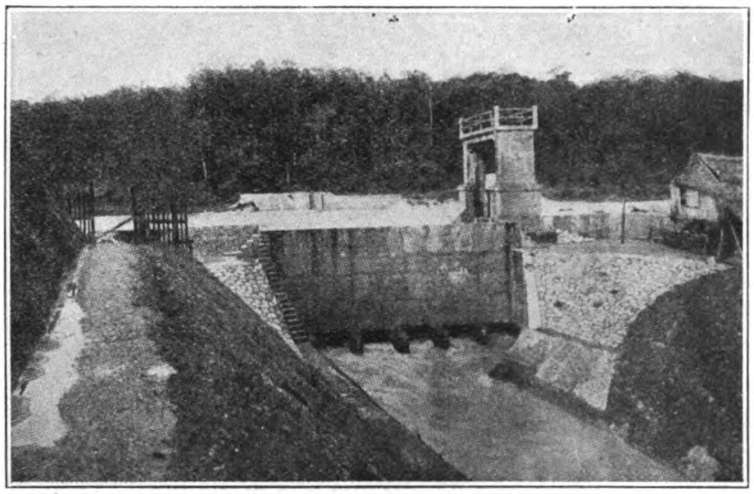
Angat River Irrigation Project.—The Atlantic, Gulf and Pacific Co., of Manila, contractors for the excavation of the south side canal system made very satisfactory progress during 1922 and it is thought that this work will be completed approximately on contract time or, in any case, during the present dry season. Three drag-line excavators and two large derricks have been used in excavating the main canal and a large force of labor employed on the smaller canals. The work remaining to be finished at the end of the year was largely confined to the first kilometre of the main canal which is in deep cut, involving considerable road work.

The contract for the construction of the diversion works was



Chute at 15-metre fall, main canal, Talavera River Irrigation System, sight of proposed power plant, Nueva Ecija, P.I.

awarded to Mr. J. B. Findley, of Manila in April, but the early rains, which started in May and a late rainy season, prevented the contractor from accomplishing any work on the diversion weir proper other than excavating material above the normal water level. Considerable work, however, was performed on the construction of both the north and south side headgates and scouring sluices, which were successfully protected from floods. The delay in getting work started on the diversion weir means that the contractor is probably limited to one short dry season for completing the contract or will have to take the risk of holding uncompleted work in a large river during the rainy season, since the contract time expires the latter part of August, 1923. The work remaining to be finished involves the pouring of approximately 20,000 cubic metres of concrete and a large amount of wet excavation.



Diversion Works, Talavera River Irrigation System, Nueva Ecija, P.I.

The preparation of plans of canal structures for the south side system was practically completed at the end of the year and additional funds were requested with a view to starting construction work early in 1923. It will probably require from one to one and a-half years to complete all canal structures for the south side system, which serves 15,000 hectares, but it is expected that water can be furnished to a portion of the land for the 1923 rice crop. Present plans contemplate starting the construction of the north side system in 1924 and completing the project as a whole in 1925.

Lamao Experiment Station Irrigation Project.—The construction of this project was discontinued in August, 1921, and P.25,000 of the P.30,000 appropriation reverted by the emergency board to the insular treasury. This being a special project for the bureau of agriculture, bond issue funds have not been provided for completing same. It is proposed to resume construction work as soon as additional funds can be made available.

Laoag-Vintar Irrigation Project.—This project was approved for construction in 1921 but it was necessary to delay construction work until bond issue funds were released in September, 1922. Bids for canal excavation work were opened in December, 1922, and a contract was awarded for this work to Mr. Sotero Baluyot, of Pampanga, at very satisfactory prices. The contract provides that this work shall be completed by June 1, 1924. Funds have been requested for starting the construction of the diversion works and it is expected to complete this project in 1924.

Operation and Maintenance

The following tabe gives the area irrigated and the financial status of insular irrigation systems operated and maintained by the division :—

Name of System	Province	Cost	Irrigable area Hectares	Area irrigated, 1922 Hectares	Cost of operation and maintenance, 1922	Total water charges, 1922	Remarks
Pilar	Bataan ...	P25,000	200.00	176.72	P1,616.54	P3,071.45	Completed in 1912.
San Miguel	Tarlac ...	1,089,000	4,000.00	2,248.00	12,527.67	15,241.00	Completed in 1913.
Santa Barbara	Iloilo ...	692,000	4,985.82	4,985.82	*786.53	†3,774.26	System officially opened December 1, 1922.
	Total ...	1,806,000	9,185.82	7,410.54	14,930.74	22,086.71	

*Cost for December, 1922. †Charges for December only.

The San Miguel irrigation system is operated and maintained by the government in accordance with the terms of contracts with the *Compania General de Tabacos de Filipinas*, the owner of all the land served by the system, while the Pilar and Santa Barbara systems were operated and maintained under the provisions of the irrigation act.

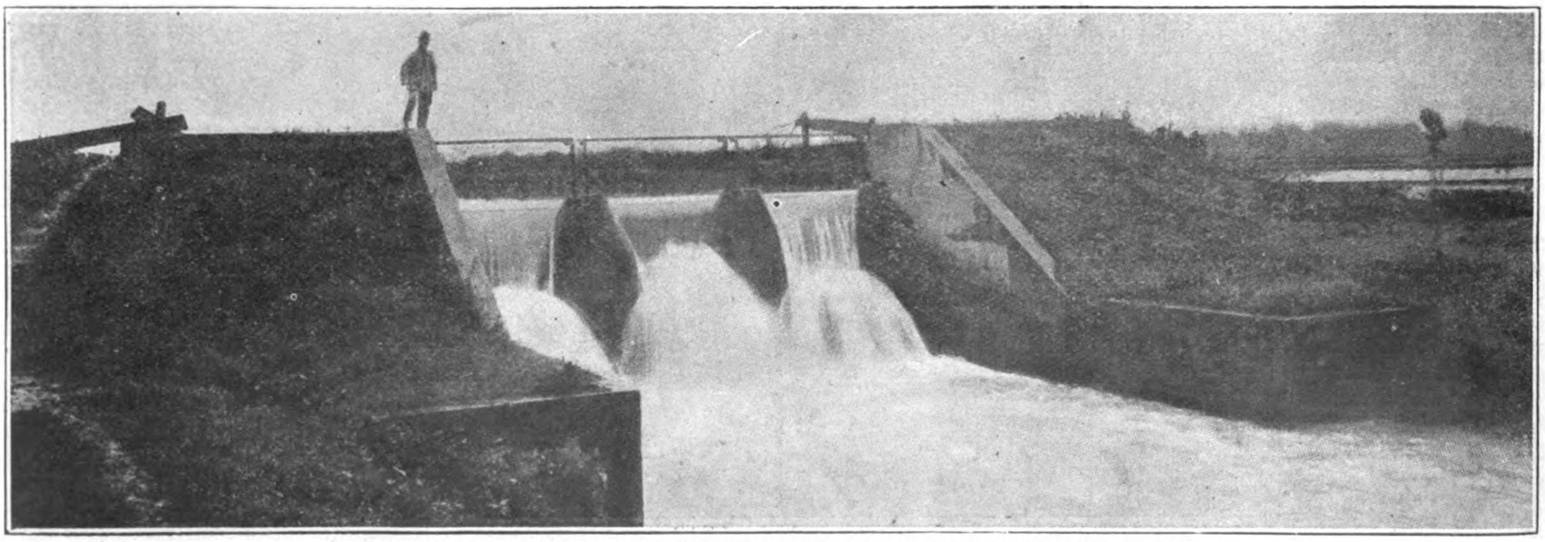
Considerable maintenance and repair work was also performed on the following Friar lands irrigation systems which are administered by the bureau of lands :—

Name	Estate	Province
Legidero system	Santa Cruz de Malabon	Cavite
Matanda system	do.	do.
San Cristobal system	Calamba Estate	...Laguna

Municipal Irrigation Projects

The following table gives the status of all municipal irrigation projects which have approved for construction under the provisions of Act 2755 :—

Project	Province	Irrigable area Hectares	Cost Insular	Cost Municipal	Remarks
Santa Maria	Zamboanga	431	P16,000	P7,000	Completed 1920.
Ayala	do.	183	11,500	5,500	Completed 1922.
Dipolog	do.	1,000	37,500	14,000	50 per cent. completed
Total		1,614	65,000	26,500	



Standard type of Notched Full, Main Canal, Talavera River Irrigation System, P.I.

The Santa Maria and Ayala systems, upon completion, were turned over to the municipality of Zamboanga for administration as provided for in Act 2755. Construction work on the Dipolog project was discontinued by the district engineer in June, 1921, due to lack of funds and no work was accomplished during 1922 on account of the inability of the municipality of Dipolog to provide funds for financing the completion of the work. Upon the request of the municipal council of Dipolog and the provincial board of Zamboanga province, this project was approved for completion as an insular project, under the provision of Act 2152, in December, 1922. Irrigation notices are being served on the interested land-owners and if no protests are received, construction work can be resumed in May, 1923. The revised estimate of cost is P.115,000.

Irrigation Projects under Consideration

The following list gives the location, irrigable area, and status of important irrigation projects under consideration :—

Province	Project	Irrigable area *Ha*	Status
Albay	Quinale Lake Bato	6,000	Awaiting investigation.
,,	Malinao-Tabaco	600	,,
Camarines Norte	Daet	2,000	Topographic survey completed.
,,	Talisay-Indan	3,000	,,
Camarines Sur	San Jose-Hagonoy	5,000	Awaiting investigation.
,,	Pauili Valley	5,000	Topographic survey completed.
,,	Barit River	2,000	Awaiting investigation.
Antique	Sibalom	3,800	Topographic survey completed.
Bataan	Dinalupijan	2,500	Awaiting investigation.
,,	Orion	1,270	Topographic survey completed.
Capiz	Maayon	2,000	Awaiting investigation.
,,	Mambusao	1,000	Preliminary investigation 1911.
,,	Macato-Malinao	1,200	,,
,,	Ibahay	500	,,
Cavite	Maragondon	1,400	Topographic survey completed.
Ilocos Norte	San Nicolas	4,000	Preliminary investigation 1910.
Ilocos Sur	Abra River	10,000	Preliminary survey completed 1909.
,,	Candon	3,000	Topographic survey completed.
,,	Santa Cruz	1,000	Preliminary survey completed.
Batangas	Batangas	1,000	Investigation in progress.
,,	Balayan	300	,,
,,	San Juan de Bocboc	1,000	Awaiting investigation.
Iloilo	Jalaur River	18,500	Topographic survey completed.
,,	Pototan	2,300	Survey and preliminary design made.
,,	Cordova	2,000	Topographic survey completed.
Isabela	Magat River	40,000	Awaiting investigation.
Laguna	Santa Cruz River	5,000	Topographic survey completed.
La Union	Balaoan	1,200	Survey and plans completed.
,,	Bacnotan	2,000	Topographic survey completed.
La Union	Agoo-Tubao	2,000	Awaiting investigation.
,,	Naguilian	1,000	Preliminary survey completed.
,,	Rosario	1,000	Topographic survey completed.
,,	San Juan	1,000	Awaiting investigation.
Leyte	Barugo	1,000	Topographic survey completed.
,,	Dagami - Tanauan	14,000	Awaiting investigation.
,,	Dato-Hilongos	3,500	,,
Nueva Ecija	Pampanga River	25,000	Topographic survey practically completed.
,,	Peñaranda	17,500	Topographic survey completed.
Nueva Vizcaya	Murong	1,200	,,
Occidental Negros	Binalbagan-Himamaylan	3,000	,,
,,	Bago	20,000	Topographic survey in progress.
,,	Silay Projection	5,000	Anwaiting investigation.
Oriental Negros	La Granja Exporting Station	200	Investigation in progerss.
,,	Tanjay	800	Awaiting investigation.
,,	Tolong	3,000	Preliminary investigation completed.
Pampanga	Porac River	1,000	Topographic survey completed.
,,	Bamban	3,000	,,
,,	Gumain	5,000	,,
Pangasinan	Agno	30,000	Topographic survey in progress.
,,	Mangatarem River	2,000	Recommended for construction, Act 2755.
,,	San Fabian	4,000	Recommended for construction, Act 2755.
Rizal	Mariquina Valley	5,000	Topographic survey completed.
,,	Pililla	180	Recommended for construction, Act 2755.
,,	Morong	580	Recommended for construction, Act 2755.
Tarlac	Capas	5,000	Topographic survey completed.
,,	Tarlac	30,000	Awaiting investigation.
Zambales	San Marcelino	5,000	Topographic survey completed,
,,	Toton-Lanom	600	,,
,,	Iba	400	,,
Total		319,530	

Topographic surveys were completed during 1922 of the Candon project, in Ilocos Sur, and the Santa Cruz River project, in Laguna, covering a total area of over 10,000 hectares. Survey work was also practically completed for the Pampanga River project in Nueva Ecija, which embraces an area of about 30,000 hectares. This makes 31 projects, which have been surveyed and are ready for construction as soon as funds can be made available. These projects would irrigate a total area of over 160,000 hectares, while projects under, or awaiting, investigation would benefit an additional estimated area of 160,000 hectares. Investigations were in progress at the end of the year, with survey parties in the field, on the Bago River project, Occidental Negros; Naguilian River project, La Union ; Agno River project, Pangasinan and Pampanga River project, Nueva Ecija.

Five-Year Program for the Construction of Irrigation Projects

In addition to insular irrigation projects now under construction, the following projects have been tentatively included in the program for the construction of irrigation projects from the twenty million pesos appropriation authorized by Act. 3011 :

Project	Province	Irrigable area	Estimated cost	Remarks
Murong	Nueva Vizcaya	1,500	P130,000	
Sibalom	Antique	3,800	500,000	Construction recommended in 1922.
Santo Tomas River	Zambales	4,000	450,000	
Capas (San Miguel Extension)	Tarlac	4,500	285,000	Construction recommended in 1922.
Peñaranda River	Nueva Ecija and Bulacan	17,500	2,300,000	,,
Barugo	Leyte	1,000	200,000	
Agno River	Pangasinan	30,000	5,000,000	
Pampanga River	Nueva Ecija	25,000	3,000,000	
Pañgiplan River	Occidental Negros	3,000	400,000	
Bacnotan	La Union	2,000	200,000	
Santa Cruz River	Laguna	5,000	650,000	
Daet-Talisay	Camarines Norte	4,000	500,000	
Total		101,300	13,615,000	

At three places in the principal island of New Zealing, hydro-electric developments are under way. They are: Arapuni Rapids, 96,000 horsepower; Lake Waikaremoana, 40,004 horsepower; and Mangahao, 24,000 horsepower. With other smalles stations they will be joined in a huge triangle, 1100 miles of electric current transmission, at 110,000 volts, to supply electric service to every section.

A large lake in the interior of Tasmania, off the coast of Australia, 3000 feet above the sea, will furnish water power for a hydro-electric plant at Waddamanna, from which two cities, Launceston at the northern extremity and Hobart at the southern are supplied.

Artificial lakes in the high mountains of western India impound water from which comes the energy that, flowing through mountain tunnels, is made to prive waterwheels which transform the force the water into electric cusrent. The latter is sent from 40 to 60 miles to Bombay, India's industrial seaport.

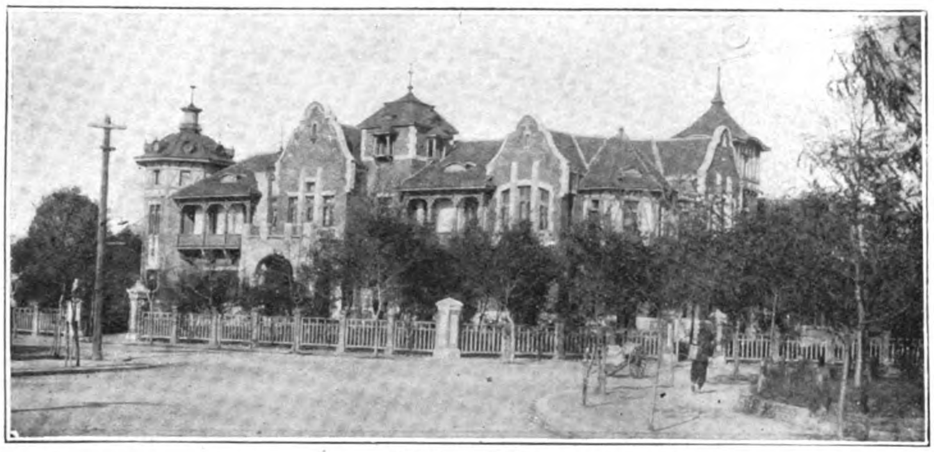
New Colliery Town of Fushun

OUR readers, says the *Manchuria Daily News*, will recollect how the S.M.R. Co. bought up the privately-owned buildings in the railway town of Fushun, leaving the purchase of those in the quarter commonly known as Shinmachi adjoining the colliery town still open for a future settlement. As regards the construction of a new town at Yungantai to take the place of the existing colliery town, an announcement on the subject was made by Mr. M. Umeno (general manager of the Fushun Collieries and also of the Anshan Iron and Steel Works), on October 13, to the following effect:

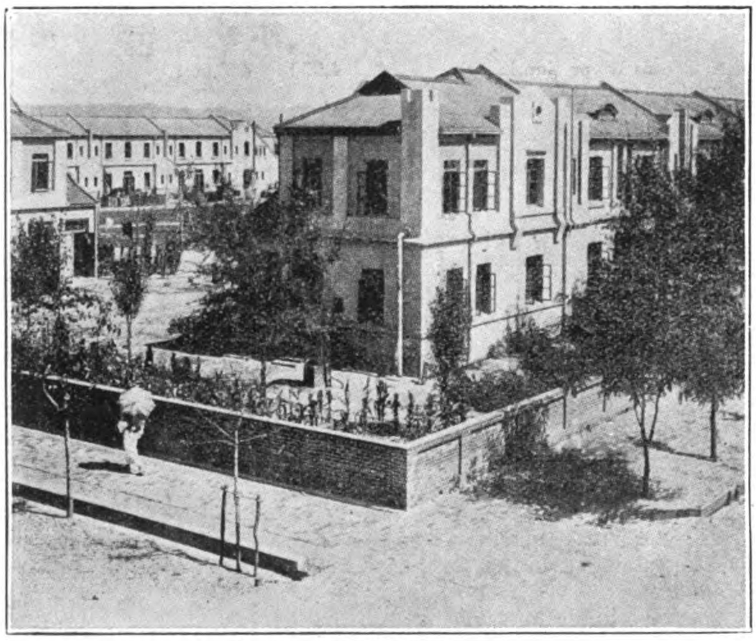
The heights in the proposed site comprising 260,000 *tsubo*, are set apart for the residential quarter, and 300,000 *tsubo* on the lower level, for the business quarter. 180,000 *tsubo* in total area on the east and west of the town site is for two parks; and for the railway station, a tract of 80,000 *tsubo* is appropriated. The area on the north side of the station is reserved for the produce dealers. The capacity for the business quarter is put at 5,000 people, and that for the residential quarter at between 8,000 and 10,000. The capacities mentioned may be comfortably exceeded. A good sized area is reserved adjacently to the business quarter to which Chinese businessmen are cordially welcomed. The colliery office, with schools, hospitals, market place, library, clubs, etc., will be located south of the business quarter, and adjoin the residential quarter on the east. Temples and churches will be situated on the slopes between the heights and the business district. The sites for the colliery shrine and the restaurant quarter remain indeterminate. The war memorial, a cemetery, a swimming pool, a recreation ground, etc., will be located in the park ground or the green zones. In order to protect the town from possible inundation, a strong embankment is to be constructed in the shape of the capital letter " L " down to near the bank of the Yangpaipu River. The street in front of the railway station will be lined with S.M.R. Co. office buildings on both sides. The electric tramway will encircle the town, connecting with the present colliery town, which, on the prospective removal of the town, will be known as Chienchinchai. Any part of the new town will thereby be made accessible on foot in ten minutes at the most. For the construction of the embankment, that will comprise something like 330,000 cubic *tsubo* (1 cubic *tsubo* being 36 cubic feet), will be built of the earth to be obtained by extending the open cut mining system to the existing colliery town. For a sewage system, the pumping appliance will be installed after the example of Antung, to provide against a possible deluge of the Hun River, in which event the ordinary drainage equipment will be found wanting. One novel feature of the town planning is that all lavatories will be of the flushing system. As to gas service, it may be made available from next year. The average dwelling area is placed at 60 or 70 *tsubo* per house for rent. When the new town gets ready for residence and occupancy, it will be perhaps the most picturesque in all Manchuria.

The removal of the colliery office, government and other principal establishments, would have to keep pace with the progress of the open cut mining. Otherwise, capital would be needlessly fixed. What shape the future open cut mining will assume still lies under study.

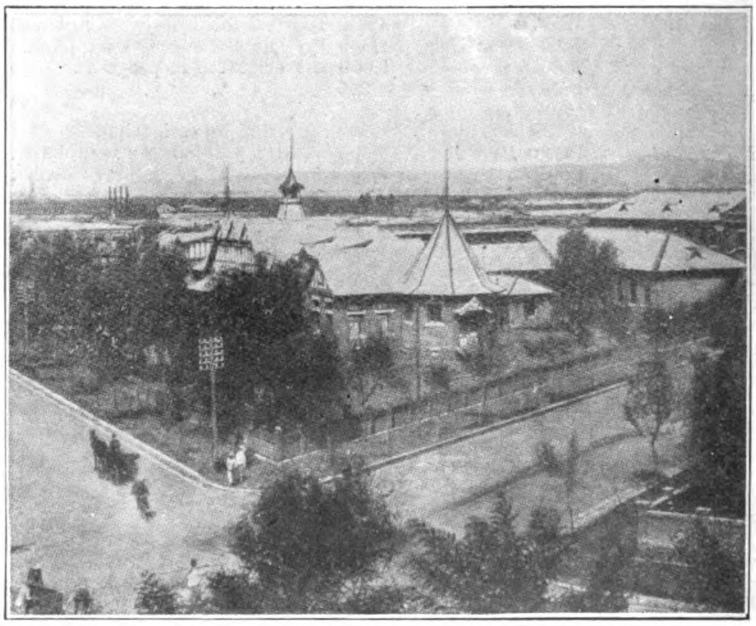
At present the plan has been drafted to extend over 20 years, but the time may be cut down to 15 years or so, far a good deal depends on what progress may be accomplished by the underground mining. At all events, for 30 years hence the Fushun Collieries will maintain the highest tension of activity.



Colliery Club



Homes of Skilled Laborers



Elementary School

TYPES OF BUILDINGS IN THE COLLIERY TOWN OF FUSHUN

Two Plans for Future Open-Cut-Mining

The future open-cut-mining plan on an extensive scale involves divers engineering and other activities. There are two plans to be laid before the S.M.R. Co. Directorate, one by Mr. T. Onuma, superintendent, the Kuchengtzu Mining Office, Fushun, to whom the credit of conceiving the plan of working the enormous coal-field of Fushun by open cut is due, and the other by Mr. L. D. Davenport, the American mining engineer, who was a member of the American specialists' party that visited Fushun in the summer of 1921, assisted by Mr. G. W. Batailson. The latter plan had been completed by the 15th inst. and Mr. Batilson has started on a fortnight's tour of Peking and Tientsin. The former plan, too, is expected to be ready before the end of this month.

Equipment and Operation of the Port of Sabang

Paper Read Before the Engineering Congress at Batavia by G. C. Quarles

Equipment of the Port

FIRST of all the difference has to be taken into account between the requirements for a port of ultimate destination with large imports and exports, where in a general way steamers complete discharge, and the accommodation required for a port of call mainly designed for the supply of bunkers and stores and for the transhipment of goods.

Port of Sabang

For an equal amount of tonnage, more length of quay will be required in a port of ultimate destination than in a bunkering and transhipment port, because in a general way the berth will be longer occupied by the steamer in the former case than in the latter one.

In the former case namely the steamer has to be fully diss charged, her holds will have to be cleaned, eventual repair-effectuated and the sailing date fixed with the necessary latitude.

In a transhipment port the quantity of cargo handled will be less in comparison to the tonnage of the steamer than in a port of ultimate destination.

Therefore *quick despatch* is the principal thing required for a transhipment port and specially for the discharge of coal cargoes and the bunkering of steamers.

The following example speaks for itself :—

A 10,000 tons steamer which is being runned at a daily cost of say £80 and has to replenish her bunkers with 200 tons, if detained 12 hours for entering the port, berthing, coaling and unmooring, will incur an additional expense in consequence of detention of $\frac{800}{200}$s, viz, 4s. per ton in addition to the price of the coal.

On the other hand if a coaling station can guarantee bunkering at the rate of 100 tons an hour and say one additional hour for berthing and unmooring it will for steamers loading cargo on their deadweight certainly pay to load 200 tons more cargo at loading port and call for this quantity of bunkers at an intermediate coaling station. For a 10,000 tons steamer as above mentioned three hours detention will only mean an expense of £10 or 1/- per ton of coal bunkered.

At the port of discharge in a general way no such quick despatch for bunkering will be needed, as there will be ample time for same during discharge and loading of cargo.

The port of Sabang has systematically been built and equipped according to the above mentioned principle of maximum despatch for the handling of goods and coals with a minimum length of quay in order to keep expenses as low as possible.

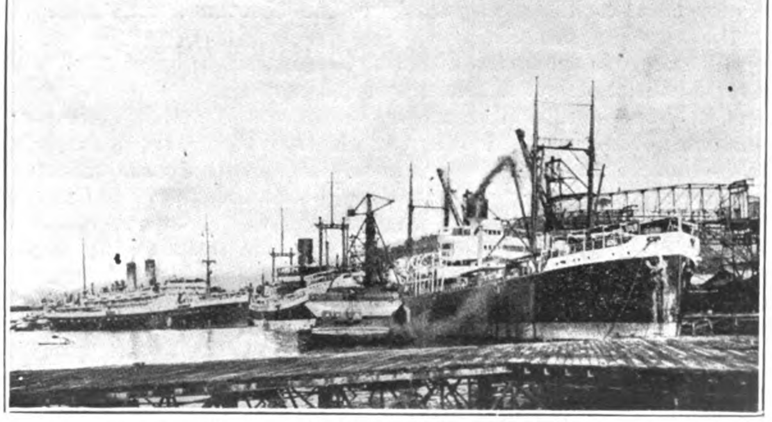
For this purpose the quays are equipped with five huge electrically driven transporters, by which iron buckets containing about 40 cwts. of coal are lifted and carried by travelers above the sheds and lowered through hatches in the roofs of same.

For bunkering the same movements are executed in an opposite direction, using in this case, however, either buckets or baskets.

Besides these transporters a powerful bunkering barge of 200 tons capacity per hour working with two shutes and another barge working with grabbuckets containing 7½ tons, used both for discharge and for bunkering, enable steamers to be discharged and bunkered day and night with the utmost despatch.

The use of these mechanical appliances has shortened the time necessary for discharging coal-cargoes to 1/6 and for bunkering to half of the time required for these manipulations when effectuated by hand labor, thus enabling to reduce the length of quay to only one-third of that, which would have been required without the above appliances.

Admitting that in a well equipped port an average of 500 tons of *general cargo* is being handled per yard quay frontage in a year, at Sabang the quantity of *coals* which can be discharged and loaded by steamers of an average length of 400-ft. would read the respectable quantity of 7,000 tons per yard if steamers followed each other up in berth regularly.



Steamers Coaling at Sabang Harbor

Though, to be sure, this theoretical quantity is not by far being recorded in practice, in fact it may be admitted that at Sabang a maximum efficiency is being obtained out of a minimum length of quay.

With regard to the fittest system for berthing steamers the following items were taken into account when making a choice between concrete quays or iron wharves and between moles or jetties, or quays (eventually wharves) parallel to the coast.

At the time of building the harbor the construction of iron wharves in a depth of water of 30-ft. involved an expenditure of about £75 per yard against an estimate of £375 per yard for a quay of concrete or stone.

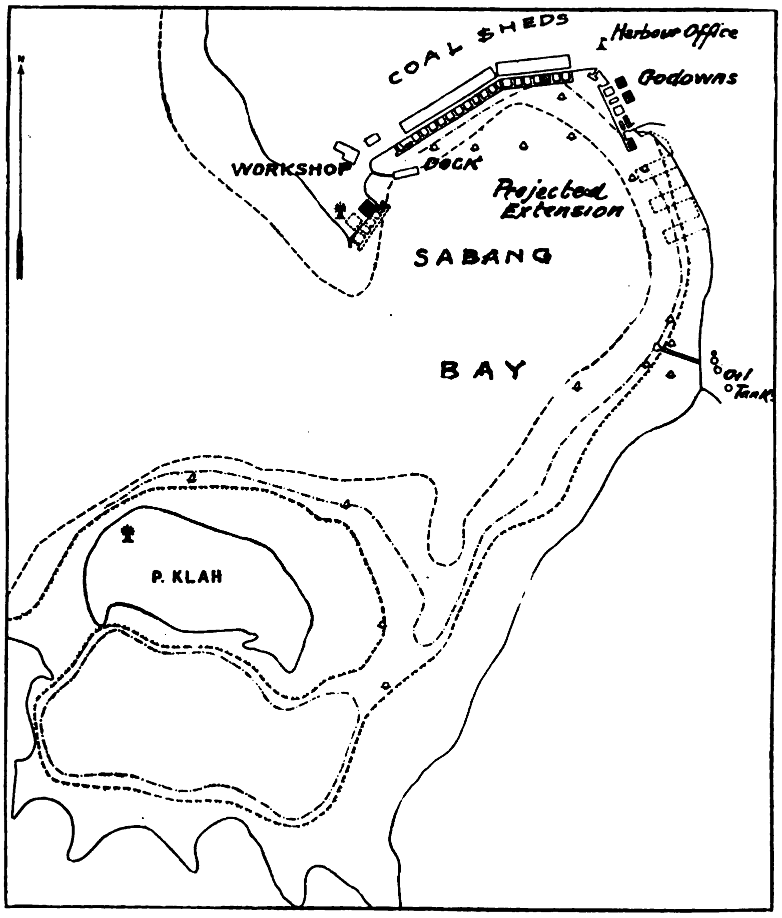
Allowing 5 per cent. for ma intenance and depreciation and taking into account 5 per cent. interest on the invested capital, the iron pier will only cost £7 10s. per yard per annum, whereas the mere interest on the capital in the case of a quay of concrete or stone without making any allowance for maintenance and depreciation will already amount to £18 15s.

With respect to the choice between jetties and wharves parallel to the coastline the following circumstances had to be taken into account:—

In the northern part of the bay, which (see annexed map) is entirely sheltered against wind and sea throughout the year, the bulider of the port was free in his choice to fix the direction of the quay frontage. Therefore in this part of the bay, where the coastline gradually bends in the form of half a circle, the front of the quay could about follow this direction.

Jetties in that part of the port were not only not required but even most undesirable

(1) because owing to the steepness of the coast and the nature of the bottom consisting of coral, sand and stones, the building of jetties of a suitable length of about 400-ft. with basins of 35-ft. depth between them, which would partly have to be digged into the coast would have met with many difficulties and heavy expenses.



Port of Sabang

(2) because in this part of the harbor the wharf frantage could easily be made of the same profile over a continuous length of 2,000-ft., thus allowing the economical installation of five large transporter cranes which can travel and be used all along the whole length of the wharf.

At the east coastof the bay, however, which is not sufficiently protected against the sea and the swell, steamers would not safely lie moored alongside piers parallel to the coastline, with sea and swell athwart of same.

Therefore in that part of the bay the system to be adopted will have to consist of jetties athwart of the coast. It, moreover, happens that the condition of the bottom in that part of the coast, consisting of sand to a depth of more than 8 fathoms, is most fit for the building of the projected moles. The heads of same, schemed in 40-ft. depth of water at low springtide, do not emerge outside of the frontage of the adjacent wharves and the construction there will not meet with difficulties. The concrete walls of the moles having only to be filled up with the sand taken from the basins between them digged and dredged at the required depth of 40-ft.

Operation and Management

Taking for granted that: (1) the equipment, operation and management of any harbor have to be such as to meet all reasonable requirements of shipping, trade and passengers with regard specially to quick despatch and cheapness; (2) the expenses for same ought not to be borne by the tax-payer but exclusively by the parties interested; (3) there must be unity and continuity with regard to the management. The first thing to be considered is the question whether the management and operation ought to be in the hands of the government (or an official harbor board) or in those of a private limited company.

The advantages of operation by the government are: that one may practically be sure, that the costs for shipping and trade will not be increased by endeavors to unduly augment profits, that the necessary means for equipment and extension of the port will practically never fail, and further that for maintaining order and regulating shipping and traffic in the harbor, the manager will have the required authority.

On the other hand the management and operation of the port by a financially strong private company will have the great advantage, that any extension of harbor works or equipment can be extended immediately when required, without having to wait for a decision of several government authorities or for the vote of parliament which will in a general way be required to obtain the necessary funds. With government management it is only after having secured the government sanction that contracts for the execution of the works can be closed, which again means a great loss of time.

It further speaks for itself that a private company are less bound to formalities and will work easier with regard to giving trade all possible facilities.

It is also most important for shipping, that the supply of coals and water, the effectuation of repairs, the handling of cargo, the working of mechanical appliances, the supply of tugs and craft, the pilotage, etc., *be in the same hands*, so that the manager can immediately arrange to meet all these requirements of a steamer calling at the port and so save her much time and a lot of trouble and expenses.

Neither the government nor any other official board can be considered apt to act as coal merchants, ship repairers, tug and barge owners, etc., and do all these business in a commercial and economical way. Therefore all the different requirements of shipping, traffic and passengers can be best met by a limited company.

In a general way also the management in hands of a company is less liable to variable views than when in hands of the government whose views change with those of successive officials, directors, governor-generals and ministers and which are subject also to the approbation or rejection of parliament.

At Sabang, since 1909, owing to a contract, which the government of Netherlands India closed with the *Sabang Bay Harbor & Coal Co., Ld.* the way of operating the port combines the advantages of both systems.

According to the said contract the government got the property of all the actual harbor works, but at the same time leaesd same to the Company for a period of fifty years.

The lease-holder takes care of the extension and improvement of the harbor works, which he deems to be in the interest of shipping and trade. The government takes over these works after completion and again lease same to the Company. If, however, the

(*Continued on page 19*)

Tin, the Cornerstone of Malaya

By Kilmer O. Moe

ANY one passing through the Federated Malay States by train or motor will not fail to notice that every stream runs thick with mud as if a thunder storm had just passed over even though the sky be clear and the sun be shining ever so brightly. This blot on nature is further intensified when the tin mines come into view.

The entire countryside is fearfully mutilated. Deep gashes and ugly wounds mar the face of nature beyond the point of recognition. Scarred and pitted with open cast mines or abandoned pits filled with muddy water, the countryside with its mounds of overburden piled everywhere, and every which way, looks for all the world as if the face of nature had been disfigured by an ugly disease which permanently mars an otherwise beautiful countenance.

Tin mining is not what you would call an industry that appeals to the artistic temperament. You just have to close your eyes to its ugly features and concentrate on its economic benefits. Think of the infinite number of ways in which this lowly metal lends itself to the service of mankind. Scarcely a household in all the world but what has experienced some use or other of tin made up in the form of containers or of utensils. From the farthest point in the frozen north to the middle of the Sahara desert, and south to the ice-bound regions of the other pole, life has been made more acceptable to all mankind because the products of all climes have been shipped in tin containers. This metal more than any other has helped to bring mankind closer together.

That is the great idea underlying the world demand for tin—*Service to Mankind*. Petroleum and gasoline, fruits and vegetables, household utensils; and toys for children, food products and commodities, in an infinite number of useful purposes come packed in tin, or are made of this useful metal. Therefore, we may well overlook this defacement oi the countryside and be truly thankful that here is a place where the metal is found in sufficient quantities to supply the world's demand. When viewed in the light of the service that is being performed the seamed and pitted countryside takes on a new meaning. Looked at from this angle the homely furrows are not defacements but the rugged features of the battle scarred hero.

The countryside is scarred beyond hopes of reclaiming by abandoned tin mines

Roughly speaking forty per cent. of the world's supply of tin comes from the Federated Malay States. How is that for service? Here is an area of a little more than twenty-five thousand square miles of territory, two-thirds of which is unexplored and unworked, yet there is taken from the ground in one year ore worth twelve million pounds sterling. The government collects an export duty on all this wealth and it is this revenue which has made the country the rich land it is now, and will yet make it richer. Tin, therefore, is the cornerstone of the wonderful economic structure that has been built up in Malaya.

Tin brought prosperity into Malaya even before the romance of rubber excited the money centrès of the world. Rubber has never been the main source of revenue for the Federated Malay States and cost the government far more than tin in roads and railroads, permanent assets though they be.

Chinese voyagers speak of tin being mined in the Malay peninsula at the beginning of the fifteenth century. D'Albuquerque, the Portuguese colonizer, found a tin coinage current in Malacca when he conquered that old world settlement in 1511. In the middle of the nineteenth century the discovery by Chinese of rich bearing tin fields in Perak led to factional fights among the Chinese miners and to British intervention in the affairs of the Federated Malay States. By 1914 the production of tin in the country had reached forty per cent. of the world's total supply. In the year 1921 the records show that two-sevenths of the tin mined went to the United Kingdom while more than three-sevenths found its way into the United States.

The Siamese undoubtedly did a good deal of mining years ago as testified to by the old workings under ground. The Malays themselves, natives of the country, did little and that probably unwillingly. To the Chinese is due the honor of opening up this industry. They came by tens under Malay rule but by thousands under British domination. They were the pioneers who proved the richness of

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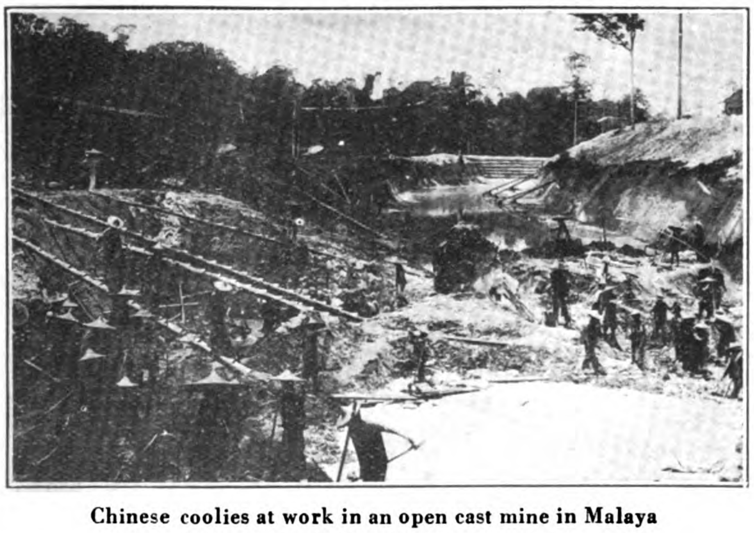
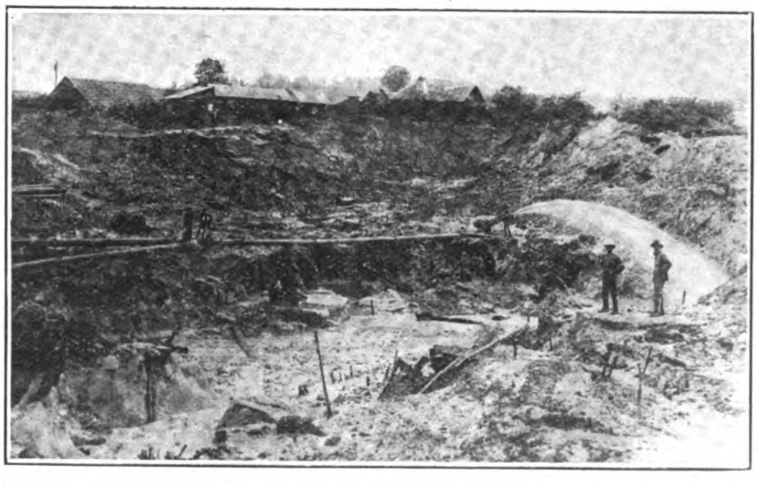


Chinese coolies at work in an open cast mine in Malaya



The monitor at work tearing out the tin-bearing ore under water pressure

New General Hospital of S.M.R. Co.

Building Lessons from the Tokyo Disaster

By S.M.R. Intelligence Bureau

The Fuller Kenchiku Kabushiki Kaisha (Messrs. Geo. A. Fuller Co. of the Orient, Ltd.) who constructed the Marunouchi Building in Tokyo, have entered into a contract on a commission system with the South Manchuria Railway Company to build the new General Hospital buildings on their new site at the southeast of the Yamato Hotel, Dairen.

The total estimated cost running up to above Y.3,000,000, the award of the big contract to a foreign firm created no small stir among the Japanese builders at that time. They have naturally been following with very keen interest how the construction work has been progressing, to satisfy themselves above all as to the one question that has suggested itself to them. "Was it really worth while giving the contract to American builders?"

Then, like a bolt from the blue, the Tokyo district was visited with the worst earthquake in the annals of Japan. How the Marunouchi building has come out of it has been a focus of curiosity. For, upon this test the reputation of the great American firm has, in a sense, depended, at least to the Japanese mind.

In the indescribable confusion following the catastrophe,—earthquake and conflagration, with the loss of nearly 80,000 lives and property valued at about Y.4,000,000,000—reports were conflicting as to the damage sustained by the Marunouchi building from the seismic disturbance. The first report said it was made useless; another stated that only some of the masonry suffered; and then the truth was made known that only slight damage has been done that can be easily repaired, demonstrating that art, in this instance at least, has prevailed over nature even in her ugliest temper.

In order to bear out our vindication of the American architects concerned with the same edifice, we should be more explicit and an extract of the expert verdict on the matter, which follows, will quite suffice:

Structural Steel

The steel frame in every case seems to have been of sufficient strength to withstand the dead loads and the sudden application of any superimposed loads due to vibrations caused by the earthquake and also seems to have shown a sufficiently high elastic limit to have returned to its original position in every case. That there was undoubtedly a marked momentary deflection laterally in the columns is evidenced by the shattering of the masonry piers surrounding or enclosing the exterior wall columns, the plastered partitions between steel columns of the interior and the distortion or destruction of the steel cross bracings.

While the momentary and violent deflection of the columns laterally, particularly in the lower stories, was of sufficient strength to shatter those parts of the structure mentioned, the agitation was not sufficient to permanently distort the structural steel in any case.

Reinforced Concrete

There does not appear to be any marked or serious damage to the reenforced concrete floor slabs or beam coverings.

Where reenforced concrete walls were used on the interior there was a minimum amount of damage, except at certain points on stairway walls near the west side of the building. This damage was probably due to the lack of continuity of these walls in a straight line.

Masonry Piers

In practically all of the exterior masonry piers of the second, third, and fourth stories, there was evidence of a violent lateral motion or vibration of the entire structure; this extended in a slighter degree to the piers of the first story and the upper stories. Above the fourth story there is more or less destruction of exterior masonry, but not nearly so pronounced as in the lower stories.

There appears to be no particular kind of material outstanding as successfully resisting the crushing and, distorting effects of the lateral movement.

Hollow brick, common brick, cut stone, reenforced concrete backing, stucco, an tiles, all showed more or less instability. The relative value of these materials might be considered in an ascending scale in the order named.

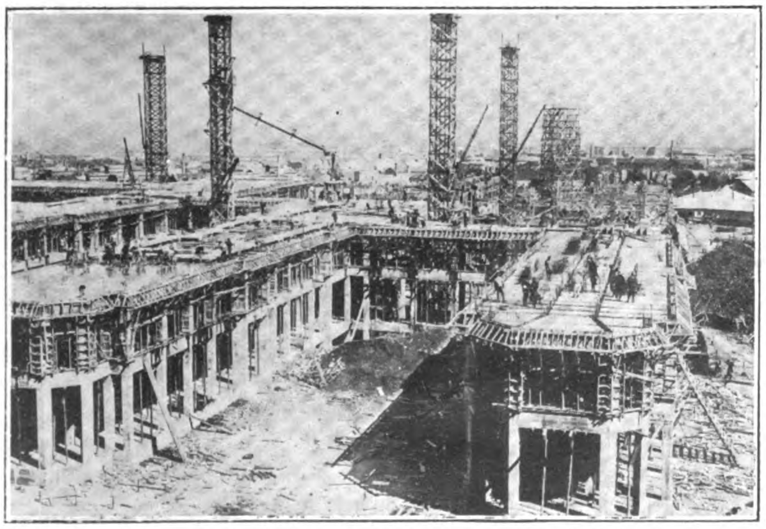
Interior Partitions

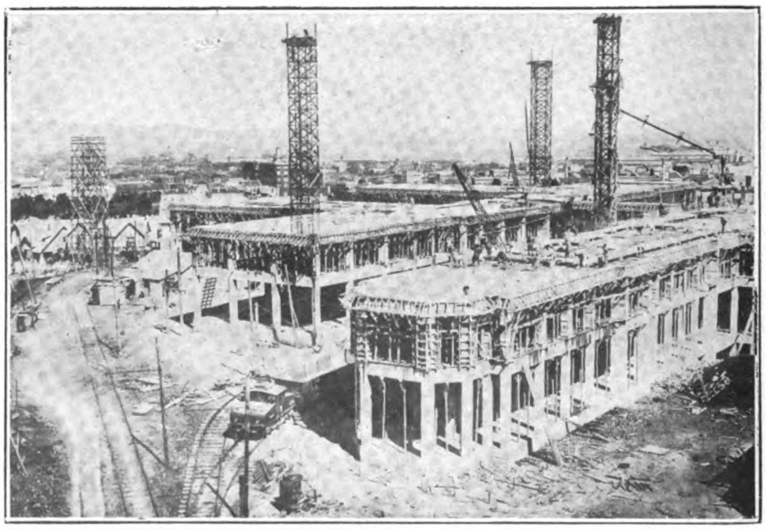
The interior partitions in general are constructed of hollow clay tiles, metal lath on steel furring, concrete or reenforced concrete all plastered on both sides. The hollow tile seems utterly unable to withstand the effect of the lateral movement of columns, as evidenced by the crushing and falling of this class of partitions where the vibration was greatest or in the lower stories. In certain locations where metal lath partitions were used there was more or less damage, but this damage was not nearly so pronounced as in the hollow clay tile partitions.

The concrete partitions behaved in a little better manner, and the reinforced concrete partitions seemed to be the best of all, but there were some cases of a shattering of these by being forced out of line by the pressure of another wall at right angles.

Marble Trim and Wainscoting

A portion of the marble finish of walls and columns in the first story was dislodged and destroyed, but as this work was done in the usually accepted manner there can be no thought of faulty workmanship.





Two views of the New General Hospital Buildings of the S.M.R. Co. at Dairen as they appeared on October 2, 1923

In Conclusion

After the San Francisco earthquake of 1906, architects and contractors held many meetings to discuss various building materials and methods of construction with a view to adopting such as seemed to be the best suited for stability. Practically all of the reconstruction work in that locality was based on designs and materials similar to or the same as those used in Tokyo in recent years, and the Tokyo buildings constructed by the Geo. A. Fuller Co. would have withstood the shocks of an earthquake of the same degree of severity as the San Francisco earthquake, with a minimum amount of damage.

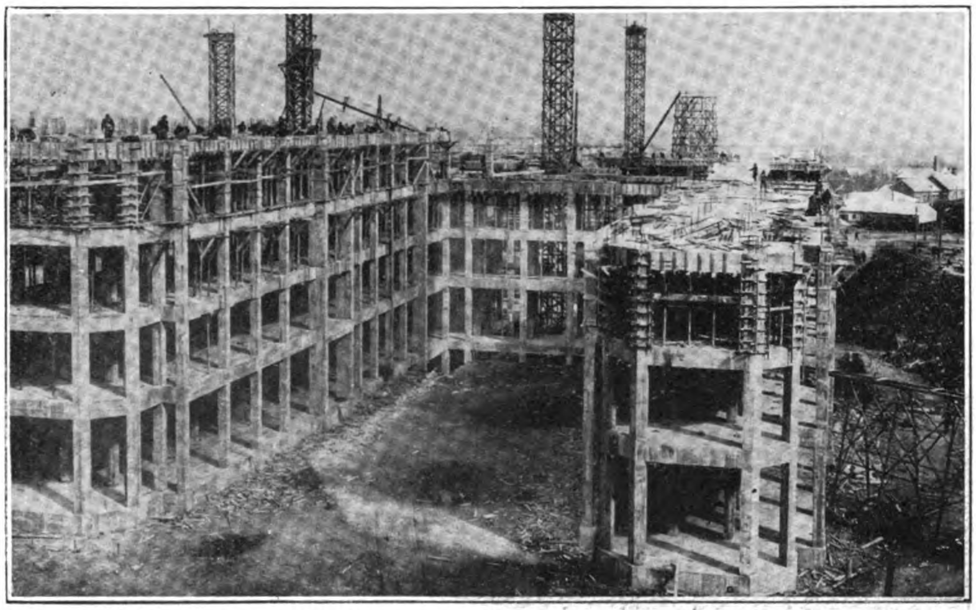
The Tokyo earthquake of 1923 was of such unprecedented severity and of such a tenacity of violence the world feel the necessity to readjust all their ideas of construction methods and to adopt such designs and take such precautions as in their belief will provide a greater measure of stability for future structures and a consequent added security for the lives of those occupying them.

Lesson Taught by Earthquake

We have reproduced at great length what damage has been done by the great earthquake to the Marunouchi bldg. (in which, by the way, the S.M.R. Co. Tokyo branch office rents a suite of rooms).

As found in the above observations, even the highest architectural authorities in Tokyo have failed to make adequate provisions for an earthquake shock of so violent a force. The recent catastrophe has served to them as an eye-opener, for they, too, have seen the necessity to "readjust their ideas of construction methods and to adopt such designs and take such precautions as are calculated to provide a greater measure of stability for future structures."

Just what shape the recommendations of these authorities may take must be of profound interest, and we shall now proceed to give them in brief, item after item.



The right wing of the New Hospital as it appeared on November 1, 1923

Foundations

A close observa-tion of the effects of the recent earthquake in Tokyo induces the belief that all foundations should be of friction piles capped with reinforced concrete, isolated pier spread footings, or a solid concrete mat without piles.

In the case of friction piles a number of test piles should be driven of different lengths and in several locations on the lot, each pile tested as to its bearing capacity and each foundation computed from the data thus obtained, allowing a safety factor of six or seven. In no case should the piles be driven to hard pan or to refusal. Each cluster of piles should be capped with reinforced concrete and these caps connected at the top in each direction with reinforced concrete struts.

In the case of isolated pier spread footings load tests should be taken in several parts of the lot at the proposed level of the footings and the size of each footing computed from the data thus obtained, allowing a safety factor of at least five. These footings should be connected in each direction with reinorced concrete struts.

In computing the loads to be carried by-either the pile-footings or the isolated pier spread footings, only the actual dead load of the structure should be used. No live load should be figured, or at the least only a very small percentage. Care should also be taken to have the bottoms of all footings at the same level, and deep basements should be avoided.

In the case of a solid concrete mat foundation the mat should be of sufficient thickness and figured for reinforcement to withstand the actual pressure on the ground as determined by computation of dead loads, and should project sufficiently beyond the outside columns to avoid eccentric loading.

The above recommendations are based on a belief that the soil underlying Tokyo will act as a sort of shock absorber, as evidenced by the behavior of such buildings as the Seiyukai building, the Imperial Hotel, and several other office buildings in Marunouchi, Tokyo.

If the foundations or the piling under them are of such length as to reach a solid stratum, then the full severity of the earthquake shock is transmitted through the foundations to the entire structure, while, if the foundations rest on a soil of somewhat resilient nature, the transmission of shock will be very much less.

Structural Steel

Columns should be placed in straight lines in each direction so that at every panel there will be a maximum number of points of resistance. The sections of the columns should be as wide as possible in each direction and should be connected at each floor by girders as deep as the requirements for head room will permit. Both columns and girders should be latticed if the computation of stresses does not require solid web plates. If solid webs are required, then the webs should be punched at frequent intervals to permit of the proper application of reinforcing steel as will be touched upon later. Between the girders at each floor will be the necessary steel beams for carrying the reinforced concrete floor slabs.

In cases where head room or clear interior spaces are absolutely necessary, then resort must be had to knee braces. It is recommended, however, that such rooms as absolutely require great height or clear interior be placed on the top story or as near thereto as possible. Rivets for connection of girders to columns should be in shear, wherever possible. Rivets in tension should be studiously avoided.

Reinforced Concrete

In all cases, the specification for the mixture for reinforced concrete should be made after a study of the screen analysis of the coarse and fine aggregates available for use. No assurance of success can be had by the adoption of arbitrary proportions for the materials to be used. The water content should also be carefully considered and only a sufficient amount of water used to enable the practical working of the concrete into the forms.

Exterior piers around steel columns should be of reinforced concrete and as large as possible, extending from the frames of openings on each side and from the heads of window frames below to the sills of window frames above.

Interior columns and connecting girders should be entirely covered with concrete, thoroughly reinforced around and through the columns and longitudinally.

Build solid reinforced concrete walls wherever possible between columns in the interior and also around such places as elevator shafts, stair wells, pipe shafts, and vent shafts.

Wherever possible build solid reinforced concrete walls from basement to roof and from outside to outside walls of building, leaving only such openings as are absolutely necessary for ingress and egress and reinforce the perimeters of such openings in a thorough manner.

Exterior Facing

Avoid the use of brick or stone veneer, if possible, using only stucco work or thin tiles and forming the outlines of projecting cornices, belt courses, etc., as largely as possible in reinforced concrete.

Partitions

If impracticable to use reinforced concrete partitions, the next best in the order named are metal lath on steel studs solid brick, hollow brick, hollow clay tie. Reinforced concrete is, of course, recommended because of the additional stiffness thereby awarded to the structure as a whole, but if this seems impracticable, then use metal lath.

Lighting Fixtures

Lighting fixtures should be either in direct system secured flat against the ceiling or should have stiff suspension.

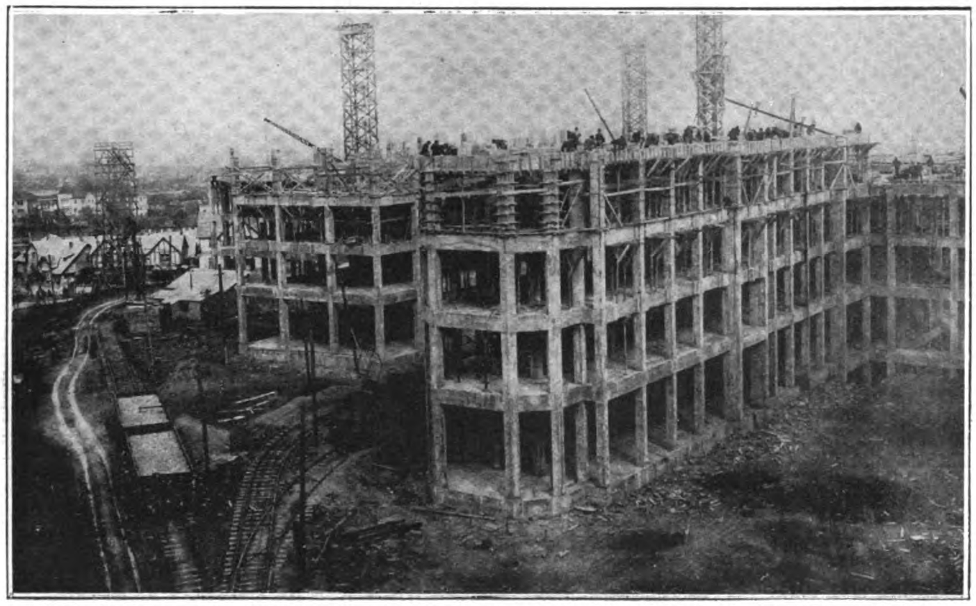
Marble

Use a minimum amount of marble slabs if the marble is to be attached to walls or columns.

Qualifications as Architects

Above, the damage done to the Marunouchi bldg., Tokyo, by the recent earthquake, has been described, together with the expert opinions as to what new provisions should be made in regard to future structures to render them as immune to earthquake shocks as humanly possible at the present stage of progress of science.

A competent architect will readily be satisfied of the intrinsic value of the skill and experience displayed in concrete form in the construction of the Marunouchi bldg. Especially, there are cases for comparison in plenty. Far from us to extol the builders of the Marunouchi bldg. from an inspired motive. There are the plan facts of how the same Edifice has weathered the terrible shock. Besides, the lesson the earthquake has taught has already been set forth in black and white. The newest knowledge just acquired is certain to be made use of in the erection of the General Hospital, Dairen.



All the building materials were hauled to the site of the New S.M.C. Hospital by electricity. This view was taken on November, 1923.

Very likely, the San Francisco earthquake has given many valuable hints to the construction experts now interested in the new hospital buildings. These hints must have guided them in the erection of the Marunouchi bldg., and now they are made doubly wiser through the severer earthquake about Tokyo.

People may say Manchuria has been free from seismic disturbances, and no such pains as is necessary to be taken in Japan is demanded in putting up a new building in Dairen. They might even add that adequate provisions against possible earthquake do not make a strong recommendation for construction work in Manchuria. Being a perfect stranger to what risk there exists for Manchuria to be visited with a strong earthquake sufficient to cause a devastation as terrible as those of San Francisco and Tokyo, we might agree to the above contention. However, the recent disaster being entirely unexpected, the good precaution provided against such a calamity may readily imply that in other respects, too, such as durability, resisting power, etc., provisions have also been made to a degree above reproof.

We may add in this connection that the plans in the cases of the Marunouchi bldg. and the General Hospital, Dairen, have been drafted by Japanese architects and Messrs. Fullers have followed these plans in construction.

How Far Construction Work has Progressed at Dairen

The ground comprises 960,000 sq. ft. The progress of construction made so far (November, 1923) may be called 45 per cent. of the whole; in point of money, 30 per cent. has been laid out; and as to time, some 38 per cent. has been passed. In structural frame, the fourth floor has been completed all round, and the columns supporting the fifth floor are now receiving attention.

The labor gang is composed of about 900 Chinese recruited through the local labor-keepers. They are under Japanese foremen, through whom only the Chinese are employed. This principle is seldom departed from. However, the Chinese include also skilled workmen such as carpenters, blacksmiths, stone masons, concrete mixers, etc.

At the outset, what means of transporting building materials should be adopted was debated upon. The relative merit of carts, motor trucks, and a railway siding was studied. An approximate total of the weight of all building materials was computed. If carts were to be used, 120,000 cartloads would have to be carried in, and as many as 600 cars might have to be jammed into the compound at a time on occasion. Besides, the tear and wear to the city roads would be frightful. This idea was plainly untenable. The idea of using motor trucks appealed as little. For, twenty or so of them would be required, and they would be constantly subject to damage, not to mention the inconvenience in loading and unloading. The final choice settled upon a railway siding, and the work of laying one from the eastern circle at the entrance to the railway wharf compound was started on March 31, only a day or two later than the day on which the ground was consecrated by the Shinto rite in the presence of Mr. T. Onogi, then chief architect of the S.M.R. Co., and Mr. W. S. Sample, general manager of construction of the American firm, who had come to Dairen on December 24, 1922, almost direct from America, etc. He had merely touched at Yokohama and Tokyo on the way.

The first train load of materials arrived in the ground on June 6.

The grading work and excavation had been commenced on April 10 and were finished on July 27. The first concrete had been laid for the foundation on May 2. The geological structure of the building site was of rocky character, which is good enough for ballast in road building, but too soft for concrete. The rather brittle nature of the rocky stratum made it an elusive article for the drills to handle, but the inconvenience felt on this score was only nominal.

Granite is obtained from a point at about 4 miles from Hsiungyocheng (famous for its hot springs). It is carried down south by railway as far as goods platform No. 2 close to the tram car sheds, Dairen, and then switched off into the temporary construction siding, to be brought past the war memorial and around the pond and the girls' high school, right into the ground. Ballast is brought either from Kochenpu, between Choushuitzu and Nankuanling, to which a siding runs from the main line, or from Hoshigaura. In the former case, the same route of conveyance as granite is taken.

With the latter, goods tram cars are used as far as below the West Honganji Temple, where the new temporary siding meets near the official residence of the commissioner of customs. Sand is carried from Shihho, a wayside station north of Chinchou. Cement is had from the Onoda Cement Factory, Choushuitzu, and bricks (tapestry brick, common brick, and partition tiles) are obtained from the Yingkou Brick Kiln, Choushuitzu. Lumber comes all the way from Changchun.

As work advances, window frames, door frames, glass, paint, lime, plaster, etc., will be procured from local or Japanese sources. The only articles for import from the United States will be reinforcing steel bars, boilers, hardware, and plumbing fixtures.

We have shown what care has been taken to let the Japanese see that, in both talent and material, the Japanese resources are drawn upon as far as possible.

The Chinese coolies are paid twice a month through their respective foremen, and a number of them are quartered in the sheds put up in the ground.

As to the construction siding, when the building work has been finished, it will be included in the city tram service. Although the rails are laid for railway trains, they are good also for electric tram traffic, the gauge being the same. Only the siding will be available for no goods cars above 30 tons each in carrying capacity.

The most interesting shop to a Japanese is of course the stone masons' shed, equipped with ten stone working machines imported from America not long ago. The men wear goggles while working one of them. Pieces of granite are carried into the shed by light rail right underneath one of the machines, which can cut, carve, and polish by the change of the tool alone. Even when only a few of them are being operated, the shed will be found full of clouds of white dust rising from the machines. They give, as may be expected, dinning noises.

A wholesome sign of industry and discipline will impress a visitor in the ground. Few coolies retain the customary easy going air about them. Every fellow is at work, plainly showing that he really means business and takes a keen personal interest in what ever work is assigned to him.

Firm's Main Office, Dairen

Turning to the management of the Oriental department of the famous American builders, Mr. James Lee Kauffmann serves as managing-director at Tokyo. Through his preliminaries, the firm has obtained the General Hospital contract from the S.M.R. Co. Unless something unforeseen turns up or extra work is undertaken, the total construction estimate is thought unlikely to exceed Y.3,000,000. The commission, to which the firm is entitled, is said to be at 13.5 per cent., as against 15 per cent. secured for the Marunouchi bldg., Tokyo. The firm now keeps its main office at Dairen, with Mr. Wilbur S. Sample and Mr. J. I. Traphagen for joint managers.

What the Huge Edifice is Like

The gigantic edifice will face on the north. The main building, which is for the administration is 52 metres (from east to west) by 16 metres (north to south). It is six-storeyed and has a wing projecting in a straight line at each end, southward and northward, leaving a front yard embraced by the wings, each 3 storeys high. The western wing is for consultations for the different divisions, of which there are nine—Interclinique, surgery, ophthalmology, rhino-laryngo-otology, dermatology, gynecology and obsterics, dental surgery, psychiatry and bacteriology. The eastern wing is for library, auditorium and archives. There are two other wings to the main building extending symmetrically westward and eastward, each being five storeyed. The one belongs to the Surgical department and contains operating room, class rooms for nurses, etc. The other wing contains rooms for X-ray and genealogical treatments, and functional examination.

The main building leads rearward by a covered corridor to the rooms for special treatments of the same length and width with, and parallel to, the main building. Rooms for gymnastic, electric, and hydrotherapuetic treatments, and massages of different kinds, pharmacy, and laboratory are found therein. It has a wing extending each 66 m. in length westward and eastward, 11 m. wide. These are sickwards. They have each another ward a little distance in the rear, running parallel thereto. They are also wards. The extremities of the four wards, all four storeyed, are Solariums or sun parlours, novel acquisitions to Dairen.

Both the main (administration) and the Speal treatment rooms have each a basement, and therein sterilizing-, store-, motor-, fan-, air-conditioning-, and cold storage-rooms, besides dispensary, laundry, refrigeratory, and lunch rooms are contained. The fans are for ventilating purposes and take the form of squirrel cage blowers. Another new feature is the air-conditioning, by which means the air in any particular part of the building may be dried, humidified, or purified.

The power house is to be built separately, but is not included in the contract, although there is a good chance of its being added thereto later, with the Mortuary which will be located in the most obscure corner. We understand that heating is to be effected by steam and by means of wall radiators or electric thermastadts.

New Yarrow Steamer for the Upper Yangtze

Yarrow & Company, Ltd. of Glasgow have secured an order for a large shallow draft river steamer for the Anglo-Saxon Petroleum Co., for service on that part of the Yangtze Kiang that lies between Ichang and Chungking where the navigation is rendered both difficult and dangerous by the many whirlpools and rapids that have to be encountered.

The vessel which will be of the Yarrow type is specially designed for this service for carrying oil fuel in bulk. The propelling machinery will consist of two sets of triple-expansion engines developing a total power of about 3,000, steam being supplied by two of the latest type of Yarrow patent water-tube boilers suitable for oil burning.

The design of this steamer will follow very closely the large number of river gunboats Yarrow & Co., Ltd. built for the British admiralty during the war, the whole flotilla of which was designed and built by them and for which they took the responsibility.

* * *

Japan Notes

The Japan Steel Tube Company, (Nihon Kokan K. K.), Tokyo, was operated at one-half of its capacity during November. The loss of the company arising from the disaster is reported to have amounted to Y.500,000 in round figures. It is also said that the company can make dividends on its preferred shares only.

* * *

The Kinugawa Hydro-electric Power Company supplied 35,-700 k.w. during November, 1923, two-thirds of its total capacity. September, it supplied one-third of its entire capacity and in October, one-half. One of its 6,000 k.w. steam generators in Tokyo has been destroyed by the earthquake, and a budget of Y.119,000 has been approved for its renewal. The business of the company has been greatly improved by the revision of contract with the Tokyo municipality.

* * *

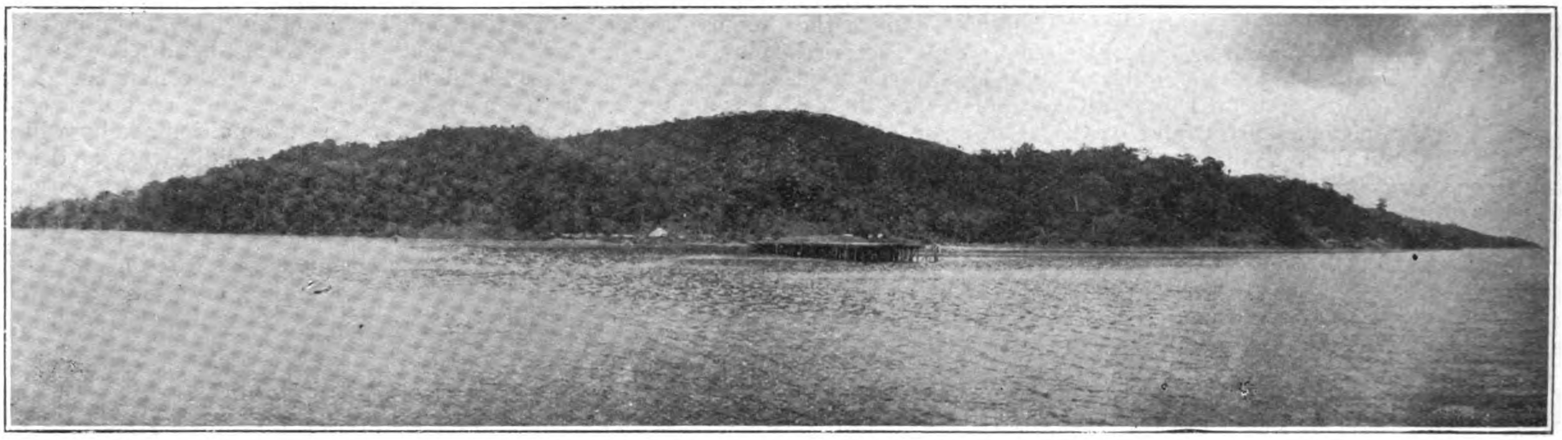
The Uraga Dockyard Company (Uraga Senkyo K. K.) decided to reduce its authorized capital of Y.10,000,000 to Y.7,000,000 at its general meeting in November last for the purpose of making up the loss of Y.4,000,000 caused by the earthquake. The decision, however, was not authorized as the number of attendance at the meeting was short of the legal number.

* * *

The Tokyo Gas Company loan of Y.3,000,000 has been guaranteed by the Dai Ichi, Jugo and the Mitsubishi Banks for restoration funds. It is reported that these three banks will get more funds for the company.

* * *

The establishment of the Sangu Electric Railway Company, which proposes to connect the cities of Nagoya and Uji-Yamada by a high speed electric railway was effected at the meeting held under auspices of the Toho Electric Power Company, mayors of Yamada, Tsu & Yokkaichi, in November last, with a capital of Y.1,000,-000, (200,000 shares). Of the total number of shares, 130,000 will be taken by the Toho Electric Power Company, and its allied companies, while the rest, amounting to 70,000, will be sold to the public in Mie prefecture.



Panorama view taken from on shipboard. looking shoreward

The Liguan Coal Mines

AMERICAN initiative is giving gradual development to the natural resources of the Philippine Islands.

In northern Luzon, American initiative and American capital are aiding in bringing a wealth of gold to the surface monthly from the Benguet Consolidated Mining Company's plant.

Just across Manila bay is the Cadwallader-Gibson Limay lumber camp—where lands are being cleared for future agricultural needs and wealth is added to the country by the development of the lumber industry.

And down off the southeast coast of Luzon on Batan Island the coal industry is being developed by A. T. Hashim, Manila.

The mine at Liguan, Batan Island, is at present supplying coal to all inter-island vessels of the Gutierrez Hermanos the Ynchausti steamship companies and two government-owned vessels. Mr. Hashim is getting out a good output of coal each month. The most modern improvements in coaling have not been attained but plans are being made for installation of increased facilities within a few months.

Geislin screen, 25 metres from Tunnel No. 5

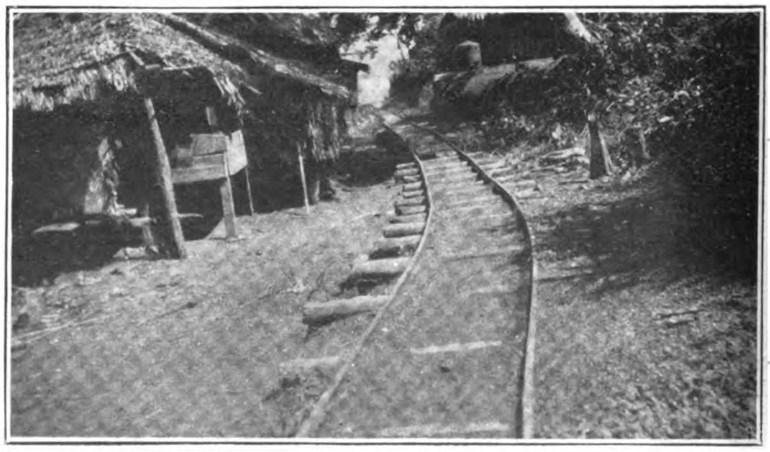
Hashim purchased the mines at the first of last year. The mines were at that time in a rather run-down condition because of lack of capital for development even on a small basis.

The mine is located on a deep-water harbor, thoroughly sheltered, and vessels of 30-ft. draft can be loaded alongside the wharf. This has a total length of 1,450-ft. of which 800-ft. goes straight out into deep water, and the remainder, 100-ft. wide, continues in an oblique direction, affording facilities for three large vessels to tie up and coal simultaneously. The coal is delivered by gravity to the pier in small coal cars, dumped and loaded directly. A record of loading 150 tons in one hour has been made.

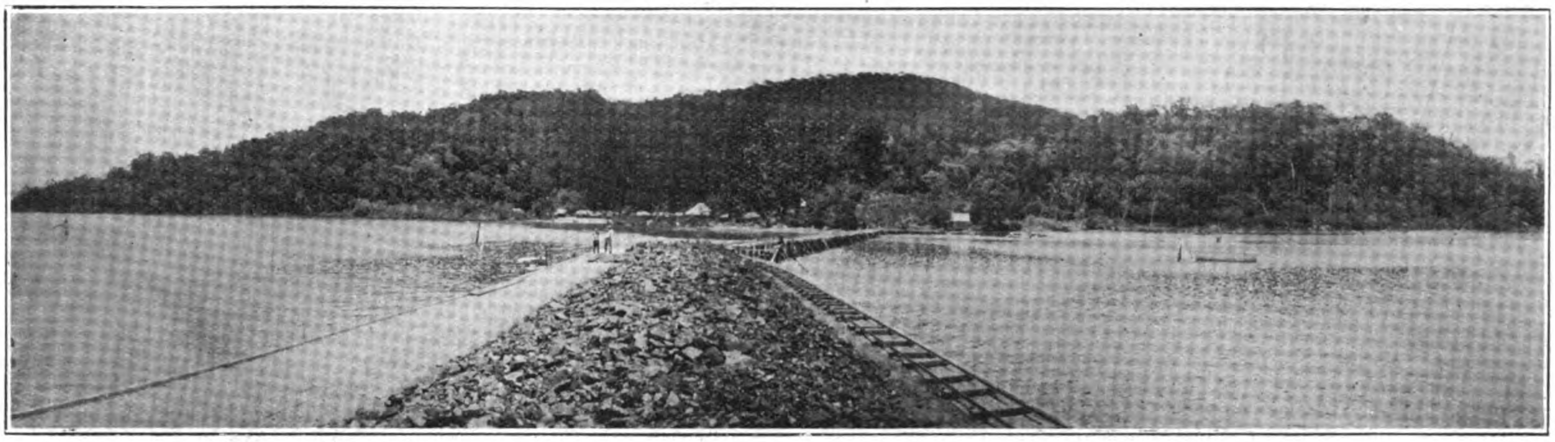
Eight tunnels care for the entire output at present. Other tunnels are under construction and when finished the output will be 100 tons per day. Nearness of the mine to the shore is an important feature, economically, precluding the necessity for expensive equipment to transport the coal to the wharf.

Work is carried on by native labor, approximately 150 laborers being employed now. The barrio of Liguan,

Loaded coal car at the level



View showing old Spanish tunnel, blacksmith shop and boiler, at sea level



Panorama view showing tressle, wharf and coal pile on wharf. Taken from outer end of wharf

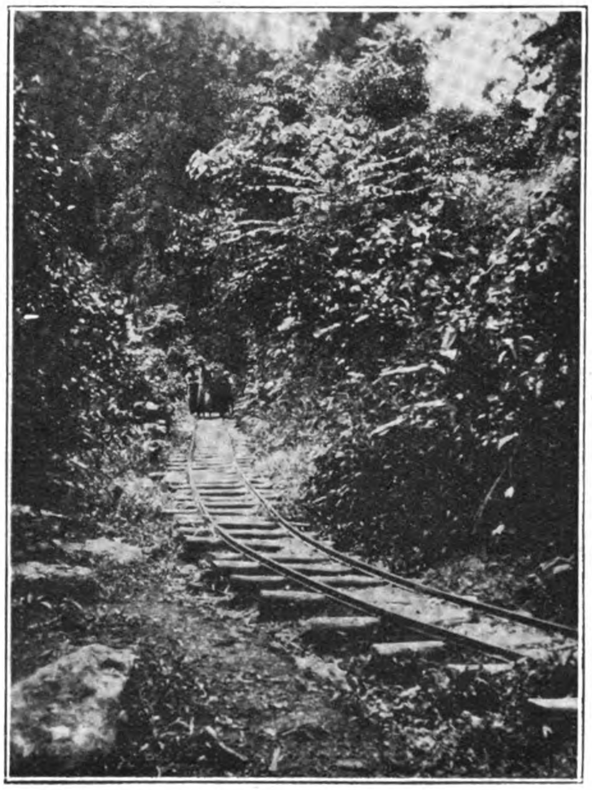
short distance from the mines, built under the supervision of the mine management, is a sanitary town of the best type. More than sixty-five families live there. A large school building has been constructed, and the bureau of education established a school there at the beginning of the present school year.

Possibilities of development of the coal industry in Batan was seen in 1901 by the United States army when Lieutenant Edward Markham, engineer, recommended Liguan as a suitable location for government mining. This recommendation followed investigation of the prospects in the islands of Batan, Cebu, Negros, Mindoro, Mindanao, Semirara and Surigao.

Very little work, however, was done on the island and practically nothing has been done by the government since 1905. Only a little prospecting had been done because of lack of capital. Several private companies, however, have operated the mines for a short time.

Batan island is coral girt but there are breaks in the reefs, so that ocean-going vessels can come within 100 yards of the shore.

Liguan offers the best harbor facilities anywhere along the east coast of Luzon for 100 miles with an anchorage, perfectly sheltered from winds.



Loaded coal car coming down by gravity from mines to the wharf

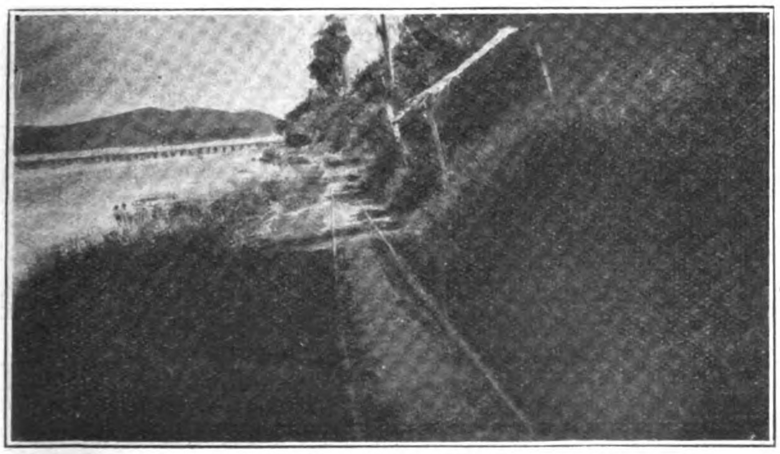
The Liguan Coal Mines embrace approximately 1,200 hectares of land.

Coals taken from the Liguan mines have been analyzed as comparing favorably with Japan, Wyoming, and British Columbia coals, which are in the same class.

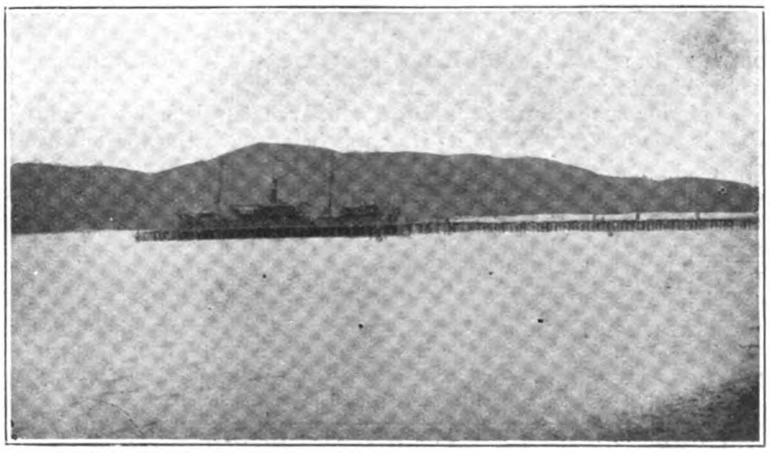
The coals, San Francisco and Big Tree, possess a good face cleat, an advantage in mining, and have fair adhesiveness and little sulphur, according to analysis by Dr. Warren Smith, former head of the mining division of the bureau of science.

Hashim isn't fearing a failure of the mine for a few years, either, he said recently. The tonnage per foot of thickness per acre for bituminous coal is generally estimated at 1,500, and there are several square miles of surface on Batan Islands, he said. The analysis of the Liguan coal, made by the bureau of science, shows:

	Per cent.
Moisture H20 ...	6.06
Volatile combustible matter	43.22
Fixed carbon ...	48.11
Ash	2.61
Total	100.00
Sulphur (determined separately) ...	0.77
Coking quality—Soft coking.	
Color of ash—Reddish brown.	
Total	.7129



Main line leading to the tressle connecting with the wharf



Inter-island steamer loading coal at the wharf

The Tea Industry in the Dutch Indies

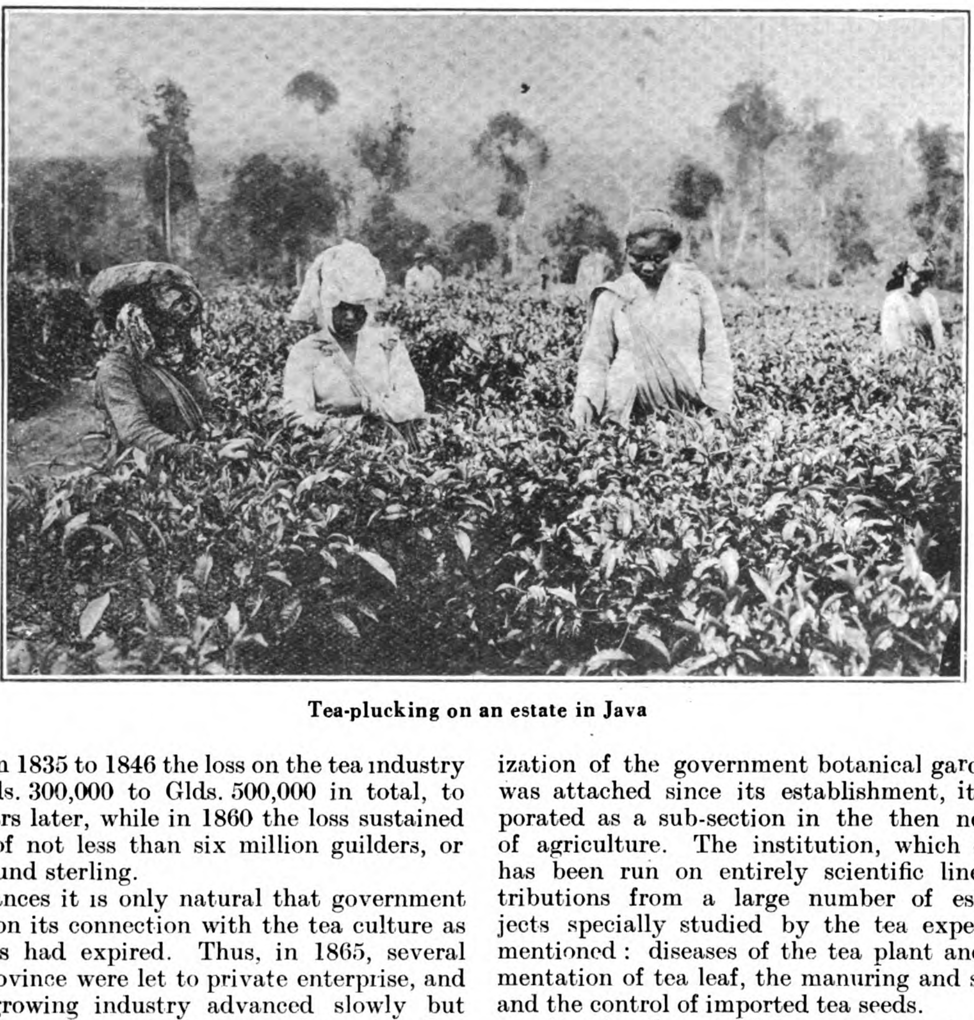
By K. R. F. Blokzeyl

AMONG the successful agricultural industries in the mountainous parts of the islands of Java and Sumatra, tea is to-day undoubtedly the most important one.

The records regarding the industry in Java are so far as the early years are concerned somewhat disjointed, but the commercial connection of the Hollanders with the article is proved to have dated back as far as the beginning of the seventeenth century, when we learn that "a considerable and profitable trade was carried on in Europe in tea from China and Japan."

It was not, however, until 1728 that the United East India Company first imported tea seed from China into the island of Java, but unfortunately regarding the result of this attempt to share the industry with China and Japan, nothing is known and presumably it was a failure. No records are available of further experiments for nearly a century, but both tea seeds and plants were secured from Japan in 1826 and 1827, and the cultivation of tea was taken up seriously though these seeds and plants do not appear to have been successful. In 1829 plants were imported from China and in the following year the production of tea was taken over and handled by the government.

In 1832 practical tea makers were brought from China and in 1838 an establishment was erected near the town of Batavia where the product was brought from the various estates to be "finished," but owing to bad roads and primitive traffic arrangements in those days, the tea had frequently to be stored for several months before being sent for its final treatment. This, of course, caused serious deterioration in quality and the establishment consequently proved to be a failure and was eventually closed down.


Tea-plucking on an estate in Java

During the period from 1835 to 1846 the loss on the tea industry in Java ranged from Glds. 300,000 to Glds. 500,000 in total, to double that figure ten years later, while in 1860 the loss sustained reached the grand total of not less than six million guilders, or approximately 500,000 pound sterling.

Under such circumstances it is only natural that government decided to entirely abandon its connection with the tea culture as soon as existing contracts had expired. Thus, in 1865, several estates in the Preanger province were let to private enterprise, and on those lands the tea-growing industry advanced slowly but steadily, while other estates were gradually opened out in other provinces of the island.

The passing, in 1870, of the agricultural law in Java, which fixed the term of land leases at 75 years, had the effect of stimulating the interest taken in the industry, and the possibility of its eventually becoming a profitable one, appears to have been more fully realized.

The quality of the product, however, continued to be inferior, and Java teas could not compete with the superior article from British India. A considerable time had to elapse before any material improvement could be achieved, but in 1877 samples were sent to London to be reported on by the brokers there. This was a step in the right direction. Full reports, together with samples of British Indian teas, were received in return, and it is this which enabled Java planters to realize how much their product was lacking in quality and manufacture.

In 1878, tea seeds were procured from Assam, British India, and this may be looked upon to be the turning point in the career of the Java tea industry. The Assam plant, as a fact, proved an immediate and great success, and so this type has become the standard for Java and, afterwards also for Sumatra.

About this time hand-manufacture was done away with and machinery came in its place, bringing with it a further considerable improvement. Tea planters went on working steadily and, in 1882, formed a society known as the "Soekaboemi Agricultural Association." This society is a most useful institution. It deals with all questions of movement to the industry and takes a prominent part in any movement which has for its object the furtherance of the interests of tea planting.

In the nineties the industry received a further fillip by the interest which the then governor-general of the colony took in it, and by the constant encouragement which he bestowed on it.

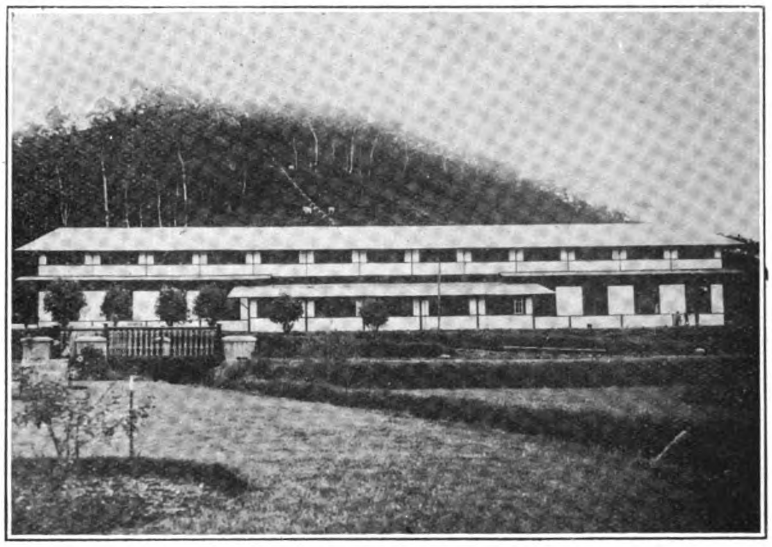
In 1886 and 1892, two well-known Java planters visited British India and Ceylon, and the knowledge gained by them led to many reforms in the method of manufacture. Gradually, old and inadequate machinery was replaced by new and up-to-date appliances, and manufacturers were unanimous in their efforts to produce a better article.

In 1890, chemical investigations were commenced regarding Java tea and, in 1902, a further and very practical move was made by establishing a tea experimental station under government control. On the re-organization of the government botanical gardens, to which the station was attached since its establishment, it became, in 1905, incorporated as a sub-section in the then newly formed department of agriculture. The institution, which ever since its foundation has been run on entirely scientific lines, is supported by contributions from a large number of estates. Among the subjects specially studied by the tea experimental station may be mentioned: diseases of the tea plant and their remedies, the fermentation of tea leaf, the manuring and selection of the tea plant, and the control of imported tea seeds.

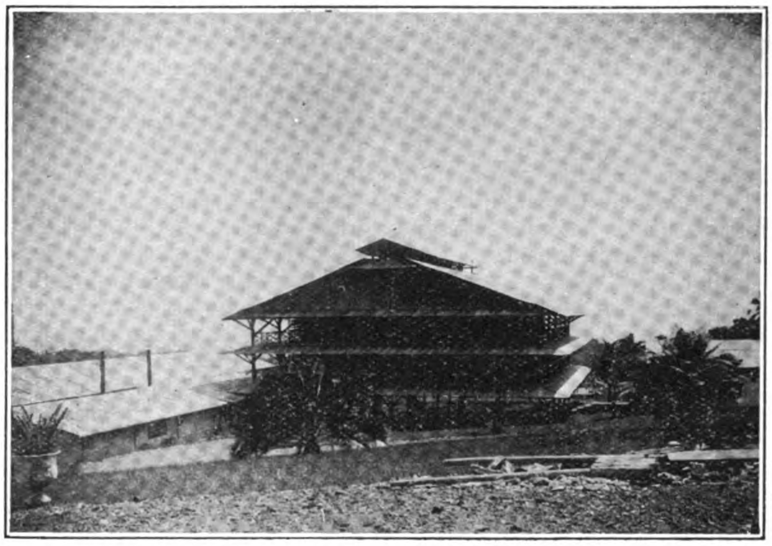
Besides the establishment of this institution, another step in the right direction was taken in 1905, when it was decided to make a determined effort to produce the very best quality of tea. For this purpose a union was formed by the leading planters and directors of planting companies, the object of which it was to decide upon the best means of improving the make of leaf, of sorting into the most advantageous grades, and bringing the quality of liquors to the highest commercial value. The union proceeded to elect an influential committee which secured the services of a tea expert with the highest qualifications and who possessed experience both of the London and the eastern markets. The office of this expert

was established in practically the centre of the tea-producing districts and, as a result of his reports on the product, of his visits to the various factories and of his advice regarding manufacture, a very great improvement was in most cases effected. So the general quality average of Java tea was raised and this improvement reflected in the prices obtained.

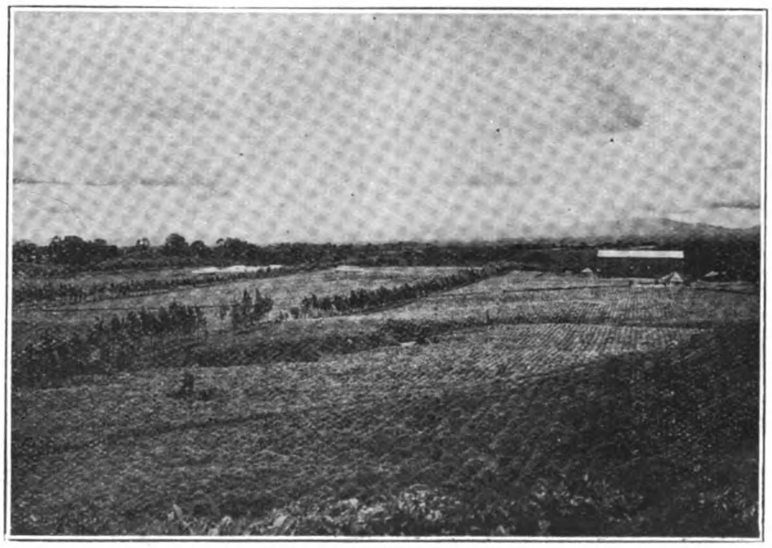
It is chiefly during the last two decades that the tea factories in Java have been completely modified, which was necessary, partly because Assam tea requires a different preparation altogether, and further on account of the competition with other tea-supplying countries, necessitating a higher standard of perfection of the product. Tiny factories, where tea was withered in the open air, rolled by hand and dried over charcoal fires, made way since the end of last century for modern equipped establishments in which neither trouble nor expense were spared to keep them continually equipped with the latest inventions relating to tea machinery and methods of manufacture.



A typical tea factory in Java



Wooden "chung" for withering of tea leaf and tea factory on the left



View on tea estate and factory in Sumatra

Speaking generally, the largest and best production is obtained from gardens situated at a height of from 1,000 to 3,000-ft. above sea-level. It may be well assumed that on grounds situated higher up a better quality is obtained, but the crop is less abundant. At a height of from 300 to 400-ft. the crop is larger but at the expense of the quality.

In regions where there is a sharp contrast between the dry and the wet season, the tea plant is not at home. Places with a regular rainfall and a sub-tropical climate, therefore, are the most suitable to its cultivation. The Preanger province in West Java, and the mountainous slopes and high plains of the east and the west coasts of Sumatra, are regions which fulfill all requirements of the tea-growing industry. Especially in the first mentioned province the cultivation has attained a high level. In Sumatra the area under tea is still small, but everything indicates that in the near future plantations over there will also attain very considerable proportions.

There are to-day in the Dutch East Indies 284 tea estates, with an area of 228,000 acres, of which 210,000 acres are in production. Of these 284 estates 256 are in Java (225 in West Java), and 28 in Sumatra. The total production in 1922 was 43,401,500 kilos, and of this 5,705,500 kilos were "kampong" teas (*i.e.*, teas grown by the native population), or about 14 per cent. of the total output. These teas were grown on about 53,000 acres.

The total capital invested in tea in the islands Java and Sumatra is approximately 10,500,000 pound sterling, of which British capital amounts to 3,000,000 pound sterling, or 35 per cent. of the total sums invested. Other foreign interests are small and would have but little effect on the percentage.

It may be remarked here that the industry in Sumatra is comparatively of young age, and almost entirely in British hands. About 1910 a company was formed to exploit the island for tea growing. The enterprise on the whole has been successful, in spite of many difficulties, the principal one—until lately—being that labor had to be imported from Java.

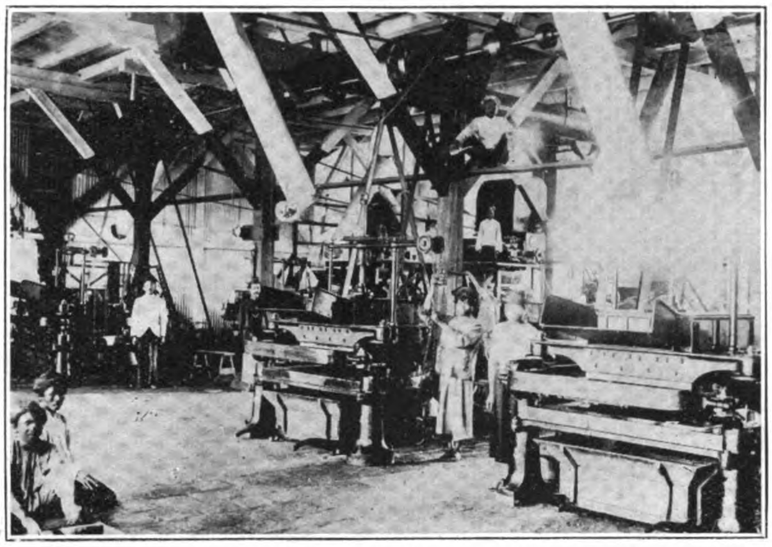
The upkeep of tea gardens requires a great deal of care. The weeding must be properly attended to in order that all noxious growths may be removed. The soil must be loosened, thus allowing the air to penetrate easily to the under layers. Care must also be taken to construct drains with a length of from 3 to 6-ft. between the shrubs. These drains are of great importance; by means of them the open air is able to penetrate to the plant roots, while during heavy showers they break the force of the rainwater, thereby preventing the fertile soil from being washed away. The humus which is washed off by the streaming water is not entirely carried away but lands largely in the drains. They also serve as gathering places for the pruned off leaves and branches, which together with dried weeds can be converted into humus.

A very important work in the gardens is the pruning. If the bushes are allowed to grow on regardless, they would not only be difficult to pick but the crop would be far from satisfactory. Through pruning the attempt is made to give the plant such a form that it will give as much leaf as possible and so that this can be easily picked. Pruning is done at varying intervals. In young plantations it is done to obtain well developed bushes, while the pruning which takes place about every five years in older gardens aims at increased production. There is also considerable difference in the methods of pruning. One rather common form is the table pruning, in which all the bushes attain an equal level, while each in itself displays the table form.

Tea leaf usually begins to be picked when the bushes have arrived at the age of three years. As a rule, the picking is done by native women, either from settlements on the estates or from "kampongs" (villages) in the neighborhood of the plantation. It would be preferable that all the leaf

suitable for picking be looked for every day throughout the entire estate, but this is practically impossible, since there is not enough labor for such a task. One must, therefore, be satisfied, especially on large estates, with the picking of certain tracts, so that within eight or ten days every part of the plantation has had its turn, after which the work is begun all over again.

An estate may pick either for quality or for quantity. In the first case only the peco, *i.e.*, the fuzzy white and leaf which is still unfolded, and the two leaves below are picked. In the second case three or four leaves are taken besides the tip. A very fine quality, the so-called gold-tip peco, is obtained by taking only one leaf along with the unfolded leaf end.


Three double action tea rollers. These machines are filled with leaves through the white tubes constructed above them

The leaf is usually carried to the factory by the picking women themselves. In Java a piece of cotton cloth is used for this purpose, in Sumatra baskets are used. Motor trucks are now also in use. In order to ensure good ventilation, the sides are fitted with wiregauze which keeps the leaf fresh and prevents undue heating. Some estates use trays, made of wooden frames with wiregauze bottoms, which are placed one on top of the other in the cart. Wire-shoots are not yet used extensively, as many systems are unreliable and necessitate frequent repairs. On the other hand some systems seem to be very satisfactory.

On some estates the leaf is carried directly to the withering sheds or lofts, but usually it is first carried to a roomy receiving shed where the leaf is weighed by an assistant of the factory manager.

In withering the leaf should lose about 30 to 40 per cent. of its weight by the evaporation of water, which process should be done without undue damage to the leaf, which becomes soft and pliable so that it can stand the rolling without breaking. This can be accomplished in two ways,—either by a " natural " method or by an artificial. In the first instance the leaf is simply spread out in thin layers and exposed to the air, either on the ground of the loft or on large flat trays, or, as is more customary, in a " chung," *i.e.*, a wooden shed with several floors each containing racks with wooden shelves. These racks are placed back to back in pairs, and between these are passages for the coolies who carry the leaf and spread it on the shelves. Every rack consists of a number of wooden shelves at a distance of about 8-in. above each other. They are either horizontal or have a slight slope towards the passage. The leaf is spread evenly in a thin layer on the shelves and it remains on it for about 16 to 18 hours. The whole building is placed in such a way that the prevailing wind blows along its longitudial axis.

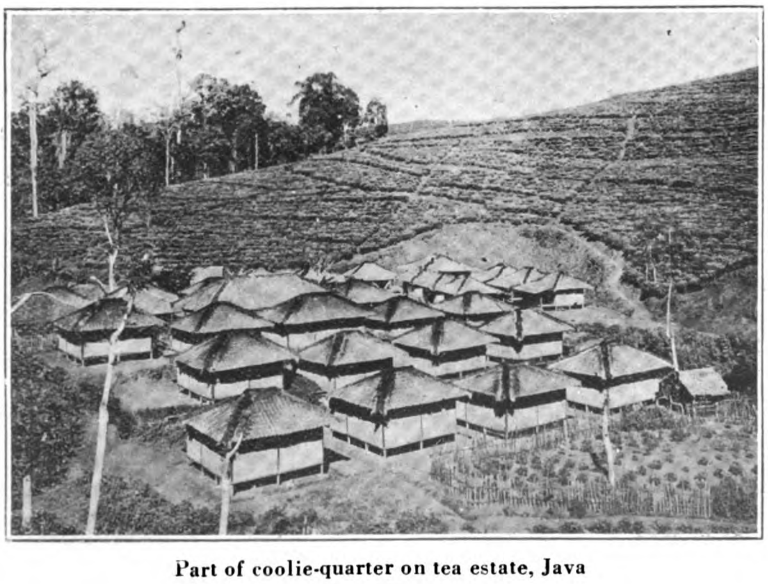
On high estates, where the nights are cool and where is often heavy mist, the chung is not practicable. Even in lower districts during the rainy season, when a great deal of leaf is brought in, the chung does not serve its purpose. To wither the leaf in the sun is out of the question, for not only would it thereby sacrifice a good deal of its quality, but the process takes place very irregularly, so that one is never sure of having sufficiently withered leaf in the morning, when the factory has to start work.

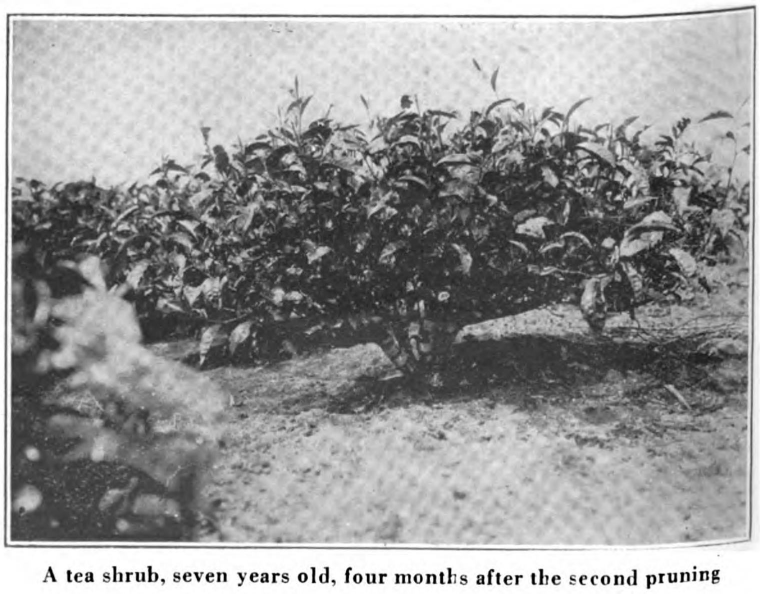
Artificial withering is, therefore, practised on a large number of the estates. It takes place in one, two, or even three lofts above the factory, or in a separate shed next to it. Here, too, spreading racks are arranged as in the chungs. They are placed back to back in pairs in a laterial direction with regard to the longitudial axis of the building. The lofts are enclosed on all sides. At one end openings are made connecting them with the factory, and at the other end are fans which, when set in motion, suck up the air so that a regular stream of warm air is brought from the factory and distributed over the tea leaf. It is the task of the factory employees to see that the stream of air is so regulated that it strikes the outspread leaf evenly and that, if necessary, it is kept at the right temperature by the addition of cold air.

Another arrangement for artificial withering is the withering-box. This is an octagonal prism made of heavy wire netting which, placed horizontally, revolves about its longitudial axis. The axle is hollow and provided with small openings through which a stream of warm air is blown through the tea leaf as it revolves in the box.

Various contrivances have been invented for unloading the leaf from the shelves, when it has been sufficiently withered. With wooden shelves it is done very simply by brushing off the leaf. If this is not done too roughly it is a fairly useful method. Wire-gauze shelves are slapped with the hands from below and this makes the leaf " jump " off, but some leaves always remain hanging in the meshes and these are sometimes damaged.

In the case of separate withering sheds the hot air is supplied by a separate air-heater, and it should be mixed first with ordinary outside air. If the mixing-room is sufficiently large, regular withering can be obtained, but if the hot and cold air are sucked over the leaf without thoroughly being mixed previously, the withering is bound to be very irregular.


Part of coolie-quarter on tea estate, Java


A tea shrub, seven years old, four months after the second pruning

The fans sometimes work all night, as long as is neceesary to wither. For instance, when the leaf comes in at noon, the fans work from as soon as the leaf can be spread until six o'clock in the morning. This is, however, not possible on all estates, as water-power is not always available, and running the fans by means of steam-engines or oil-motors would be too expensive in most cases. In such a case the fans are run until eleven o'clock or midnight and then stopped. That this is not an ideal system of withering goes without saying.

When the leaf has been well withered, and has, therefore, become sufficiently supple, it is ready to be rolled. This process, which was formerly done by hand, serves not only to improve the appearance of the tea, but serves primarily to crush the leaf, causing the cell juices to mingle and consequently enabling them to act upon each other.

The rolling machines consist of a square or cylindrical receptacle, into which the leaf is thrown. The receptacle or "jacket" moves above the table, which movement effects the rolling of the leaf. In some systems of rollers the movement is confined to the receptacle (the "single action" rollers), while in others the receptacle is stationary, and the table moves.

In the "double action" rollers both table and receptacle move in opposite directions. These machines are now being used almost exclusively, the result being better. Receptacle and table are nearly always brasslined, as some aluminium-lined rollers were found to be unsatisfactory, while the old granite-faced tables are now quite obsolete. The centre of the table is fitted with brass battens, in order to assist the rolling process, and which allows the rolled leaf to drop out when it is desired to empty the roller. The top of the receptacle is formed by a movable cap, which can be made to slide down by turning a screw and in this way a certain pressure can be exerted, which is necessary to get a thorough mixing of the juices. In the case of treating course leaf this is very urgent. Some rollers lack this pressure cap and they are called "open-top" rollers, in which the necessary pressure for the leaf is obtained by its own weight. The pressure can be gradually increased, and now and then the cap is raised entirely, in order to cool the leaf.

A special system of roller without pressure-arrangement has a sort of screw or "plow," revolving in a stationary cylindrical jacket, the table also being stationary. The rolling is only effected by the screw, and it goes without saying, that the leaf is more broken than rolled. These machines are therefore very seldom used.

In the floor of the withering lofts holes are made with a tube running down to the rolling machine, through which this machine can be filled with leaf. About 330 to 440-lb. of withered leaf are rolled at one time by each machine.

The rolling is mostly done in two stages, sometimes in three, and the fine leaf is sifted out every time after rolling, the coarse leaf only being re-rolled. For instance, after filling, the leaf is rolled 15 minutes, without using pressure, then the cap is screwed down until it just touches the leaf, in which way the rolling is continued for 5 minutes, after which the cycle of operations is repeated. After sifting, the coarse leaf is rolled again, but now the pressure is increased.

The rolled leaf is dropped from the roller into a shallow flat-bottomed trolley which is placed under the roller, and in which the leaf is transported to the "ball breaker," consisting of a revolving drum-shaped sieve, or a flat shaking sieve, especially designed for the purpose. Here the finest leaf is separated from the coarser part. The coarse leaf is re-rolled until the desired result is obtained.

After all the leaf has been sufficiently rolled and sifted it is fermented. During the rolling the leaf has already begun to ferment a little, and this process must now be continued. In order that this may take place as well as possible the leaf is spread out to a thickness of about two inches in shallow trays consisting of a wooden frame with a bottom of bamboo wickerwork. These trays are put in rows one on top of the other, and after some hours (from 1½ to 4½) the tea is fermented. In order to keep the leaf sufficiently moist during the process, wet clothes are spread over the fermenting trays.

Sometimes fermentation is done on a floor covered with glazed tiles. The leaf is thereby spread out in a very thin layer, as otherwise the air cannot reach it sufficiently, and this is absolutely necessary. In other factories, fermentation is done in a separate locality, which is a very good system, because it admits of regulating everything properly. The atmosphere in the locality can be kept moist by running water along the walls, or by sucking the air through a curtain of falling water. It is then certain that the air is saturated with water and that no undue drying out of the fermenting leaf can occur.

As a result of the fermentation process various agents in the leaf mass, such as the tea ferment and the tannin under the influence of oxygen from the atmosphere, undergo a chemical reaction whereby the color of the leaf slowly turns brown and whereby the essential oil arises to which the tea owes its flavor.

The duration of the process depends upon various circumstances, A too long fermentation may result in an entire loss of aroma. The factory employees who have charge of this process notice from the color of the leaf mass and from the odor which arises, whether the fermenting process is completed. If this is the case, the product undergoes its final process, i.e. it is brought to the "sirocco" to be dried.

There are dryers of various construction in use, such as the updraft—, the downdraft—, and the auto-siroccos, or paragons. The main idea in all these is to let the drying process take place by means of a stream of hot air. In every type, therefore, is found a furnace, in which the air is heated, and a drying chamber with trays, on which the tea-leaf is spread in thin layers. The difference consists in whether the air is blown into the drying chamber from below or from above, and whether even drying takes place by turning the trays automatically or by hand.

In the older systems which are still in use, the trays consist of large square perforated metal plates, which are taken out two coolies from the bottom of the drying chamber and re-inserted at the top, in order to expose the whole bulk of leaf to the drying air. These machines have only a small capacity, but they are easily controlled.

In the newer systems the trays are continuous, and the leaf which is nowadays mechanically spread on the upper layer of trays, drops down on the next layer and comes out at the bottom partly or entirely dried, according to the system used: drying in two stages or in one only. The speed at which the trays move is regulated in such a way that the leaf comes out dried to the extent wished.

The large machines have a capacity of 200 to 300-lb. of leaf per hour.

The drying chambers are provided with side-doors which allow easy cleaning or repairing. Thermometers are fitted, but these are not always reliable, as they do not always show the exact temperature, and should, therefore, be replaced by self-registering temperature recorders.

In order to quickly cool the dried tea, it is sometimes placed in chests with perforated ventilating tubes which act as chimneys to carry away the hot air.

Attempts are continually being made to perfect the drying machines. There seems also to have been some idea of inventing a machine by which drying can take place in the open air. Since in this case the work can be done at a much lower temperature, it is highly probable that much more of the aroma can be retained.

After the tea has been dried it is called in Java "Factory tea," and now it is ready to be sorted. This is done by drum-shaped revolving sieves, or sometimes by more complicated sorting machines with shaking sieves. A very practical sorting machine is in use in Sumatra, in which the various grades of tea are finally sorted in one operation. The machine consists of a tea cutter and a series of sieves of various mesh. Also the tea is cut to a certain size by tea cutters.

Generally the tea is re-sorted by hand by women, who also remove the stalks, fibre, etc. This hand-sorting is done very carefully, especially in Java. In this way the suitable grades for the market are obtained, from orange pecoe to dust. The sorting is regulated according to the market, and not every factory makes the same grades.

The entire process of tea manufacture, from picking to and including sortation, takes place within a period of three days.

The sorted tea is stored in sinc or lead-lined bins, until it can be packed, which is generally done very soon.

The packing of Java and Sumatra teas is done in wooden chests lined with lead, or sometimes with tin, and containing about 100-lb. net. These chests are generally made in the factory, but nowadays various patent chests made of pressed three-ply wood (the so-called triplex chests) are also used extensively. They are much stronger and arrive ready-made at the factory.

The filling of the chests is done by the so-called packing-machines, which shake the tea down by a vibratory motion. The tea is put into the machine by means of a large feed-hopper.

Tea-presses are also used in order to get more tea into one chest.

After the tea-lead has been carefully soldered and the chests closed, they are transported by motor-truck or horse-cart to the nearest railway station.

Java and Sumatra teas are of very good quality, as shown by the prices obtained on the London and Amsterdam markets. They possess great variety of flavor and distinct characters of liquor. In the teas grown on the more highly situated estates, the lighter shades of ruby tints with the aroma and flavor of Ceylon teas are found. From other estates come teas the characters of which have developed directly from the Assam seed plantings from India. The teas grown on the estates on low ground are lacking in flavor.

Before the war, Java teas were hardly known in the United States of America, but when their import was prohibited in the United Kingdom, consignments were sent to New York, both of Java and Sumatra teas. After a time the quality of the tea sent fell off and it became less popular. Planters and shippers, seeing the mistake they had made, then became more careful as to the quality of their exports to North America, with the result that more tea from the Dutch Indies, particularly from Sumatra, was taken by the States.

Australia is another country increasing her imports of Java and Sumatra teas very rapidly during the last four years.

At the present time the demand for these teas is greater than it has been for some time past, owing very largely to buying from France and the Continent. Consumption in the U. S. A. and in Canada is said to have increased considerably. Stocks of leaf are lower than they were a year ago, and as there has been no increase in the output, it is anticipated that the demand will exceed the supply before long.

The following tables, showing the quantities of tea exported from Java and Sumatra during recent years, illustrate the significance of the industry for the world's tea trade :—

Unit : Kilogrammes.

Year.	Exports from Java.	Exports from Sumatra.
1918	28,115,000	2,388,000
1919	50,246,000	4,249,000
1920	40,670,000	5,130,000
1921	30,605,000	4,557,000
1922	36,688,000	6,765,000

Tin, The Cornerstone of Malaya

(Continued from page 27).

these lands. Under Malay rule they were subject to extortion under every petty Malay chief, but they kept at it in the face of difficulties and under hardships that probably would have daunted members of any other race.

The Chinese use old-fashioned methods but seem to be quite satisfied with them still. As one passes through the country he may see them industriously opening new mines, digging over old ones, sometimes working in great gangs of workers at other times with only a few and with a very simple outfit. Wherever you turn except in purely agricultural districts, you will see a new mine just opening, a mine in full swing, or one that has been abandoned, for there are very few places in this land of tin to which the Chinaman has not penetrated.

The greatest obstruction to tin mining is water which seeps into the mine hole and prevents the laborer from taking out the ore. The Chinese have a crude chain pump which they work by treading and this lifts the water at a terrific expenditure of human energy. Having only these crude implements for keeping their mines dry enough to work they manage to excavate to the depth of only thirty or forty feet. Within recent years modern pumps have been introduced operated by steam and these serve to make tin mining much more effective.

Not all the earth taken out of a mine is tin bearing ore. Much of it is overburden which has to be removed so that the tin-bearing ground can be gotten at. This is done either by manual labor, or, in the larger mines, by a system of trucks running on rails. The mine we saw was an open cast system of considerable size. Rails for hauling the ore and the overburden were laid at different levels and pushed by coolies in a circular route on the perimeter of the mine to a trellis where the car was hitched to a cable and pulled up a steam incline by a steam winch. This mine was kept dry by the operation of steam pumps working night and day to keep the surface water at a low level. Under this system the mine in the form of an inverted cone was being worked to a depth of about a hundred feet. The outside circumference was, in all probability, more than half-a-mile.

The ore was taken to a wooden flume which had slats or riffles nailed across the bottom. It was churned up by the feet of coolies while a stream of water played over it which carried off clay and the lighter substances leaving the tin which is heavier in the bottom. This was gathered into sacks and shipped to the coast where the smelters are located.

Recent developments have introduced modern improvements in tin mining. Bucket dredges have gone beyond the experimental stage as has also the use of monitors having nozzles that play a stream of water under five or six hundred feet of pressure upon the tin-bearing ground, with enough force to disintegrate it a consistency of thick mud. This is then passed over the riffles of an open flume and the tin is extracted as above described. The Chinese coolies are very adept at separating the tin from the ore and floating off the refuse.

Tin mining in the Federated Malay States is almost entirely confined to the alluvial deposits of the river valleys, or where the rock has disintegrated which allows for operation by some sort of placer method. I was told, however, that in the state of Pahang there are mines in successful operation which handle nothing but lodes.

The high prices of tin during, and immediately following, the world war led to extensive mining operations in other tin-producing countries. But in spite of competition from other quarters the Malay peninsula still boasts of being the greatest tin-producing country on earth.

Engineering Notes from Japan

The Kagamigahara corps of the Japanese air force expects to test a new 600 h.p. aeroplane motor in actual use, with its completion within a few months at the Nagoya Machine Manufacturing Company. This motor will be the first of its kinds in Japan, with plans and designs drawn by Japanese.

* * *

The Japanese government railways department has recently completed the Ohi wireless telephone station, and expects to start tantative operations soon with the running trains on the Tokaido line, so that the passengers will be able to send out messages while riding in a train. The despatch and receipt of wireless telephone messages will be made by means of antennae which will be fixed on the roofs of the carriages.

The Nagoya and the Kobe railway bureaus will have their wireless stations built during the next fiscal year, and, with their completion, the wireless telephone services will be opened the same as on the Tokyo Bureau section of the Tokaido line.

The Railway Department expects to spend about Y.50,000 for each of these wireless telephone stations, and Y.3,000 on for wireless telephone apparatus on the trains.

* * *

The Osaka Municipality, with a budget of Y.19,000,000, proposes to construct and rebuild 162 fire and earthquake proof bridges in the city, as part of the new city improvement project, which begins in 1924 and will be completed within ten years.

The new bridges will be either of reinforced concrete or steel and the present wooden structures will all be done away with. Of the 162, sixty of them will be rebuilt over the main waterways of the city, 83 over smaller branch rivers while the remaining 19 will be entirely new.

Indo-China Railways—2

Working Lines

Continued from December issue, page 745

TOPOGRAPHICAL DETAILS

THERE are 1,293 miles of railway in the union as shewn in the table below.

The first three group are run by the colony and the fourth by a private company.

I.—Northern Group

1. HANOI TO NAM-KWAN

This line after leaving Hanoï crosses the Red River by a steel bridge, 1 mile and 77 yards long and runs through the paddy fields of the densely populated Tonkin delta by Bac-Ninh, Thi-Cau and Phu-Lang-Thuong to Kep (85 miles).

From Kep to Bac-Le the line follows the Song-Thuong river through a wooded and sparsely inhabited district.

From Bac-Le to Jiai it continues to follow the same valley, here much wider and more cultivated, between low bare hills on the east and the rocky mountains of Kai-Kinh on the west.

From Lang-Jiai the line takes on the character of a mountain railway and climbs through a wild and bare region to close to Langson where it enters the basin of the Song-Ki-Kung, a tributary of the Si-Kiang or Canton-river.

The last portion of the line runs through an easy and fairly rich and populated district.

The Cholen Station on the Saigon-Mytho Railway

Finally from Dong-Dang (3 miles before Nam-Kwan) a branch, 8 miles long, opened on November 15, 1921, runs to Na-Sham situated on a navigable reach of the Song-Ki-Kung. This branch is distinctly more important than that to Nam-Kwan and may be looked upon as the mainline.

Railways	Portions open to Traffic	Length miles	Remarks
I Northern Group ..	Hanoi to Na-Sham, 114 miles Hanoi to Vinh, 202 miles	317	
II Central Annam Group ..	Turan to Hue, Kwangtri and Dong-Ha	109	
III Southern Group ..	Saigon to Mytho, 43 miles Saigon to Nha-trang, 290 miles	333	
IV Cie Fse des Chemins de fer de l'Indo-Chine et du Yunnan ..	Haiphong to Lao-kai and Yunnan-fu	534	of which 289 miles are in China, north of Lao-kai

2. FROM HANOI TO VINH

From Hanoï this line crosses the delta of the Red River by the native towns of Phu-Li, Nam-Dinh and Ninh-Binh and reaches the Tonkin frontier at Bim-Son, 88 miles away.

At 109 miles it reaches Thanh-Hoa the capital of the province of the same name and still in a delta country, whence, following the coast, it runs into the delta of the Song-Ka and reaches Vinh, 199 miles from Hanoï.

The whole of the district through which this line runs, with the exception of between Ninh-Binh and Thanh-Hoa, is composed of the deltas of the Red River, the Song-Ma (Thanh-Hoa) and other small rivers and the Song-Ka (Vinh). It is a great rice-growing country peopled by Annamites and on the whole fairly prosperous, and is even remarkably so in the Tonkin section. As may be expected the line is pretty level.

The present terminus at Vinh is also connected by a 3-mile branch running along the river to the port of Ben-thui on the estuary of the Song-Ka. This port may become some day of importance when the proposed roads and railways connecting it with Laos and the plateau of Tran-Ninh have been materialized.

II.—Central Annam Group

The one and only railway in this group runs from Turan, the chief port of Central Annam, by the royal city of Hue (64 miles) and the capital of the province, Kwang-tri (99 miles), to its present terminus et Dong-Ha (109 miles from Turan).

Topographically it may be divided into two distinct sections. The first, up to 31 miles from Turan runs through a hilly and sparsely populated region where the line is very devious and abounds in constructive works. In the second section the line passes through or near level country by the sea which, without attaining the prosperity of the rich lands of Cochin-China or of the Tonkin delta, is yet fairly well populated.

III.—Southern Group

1. SAÏGON TO MYTHO AND CHOLON

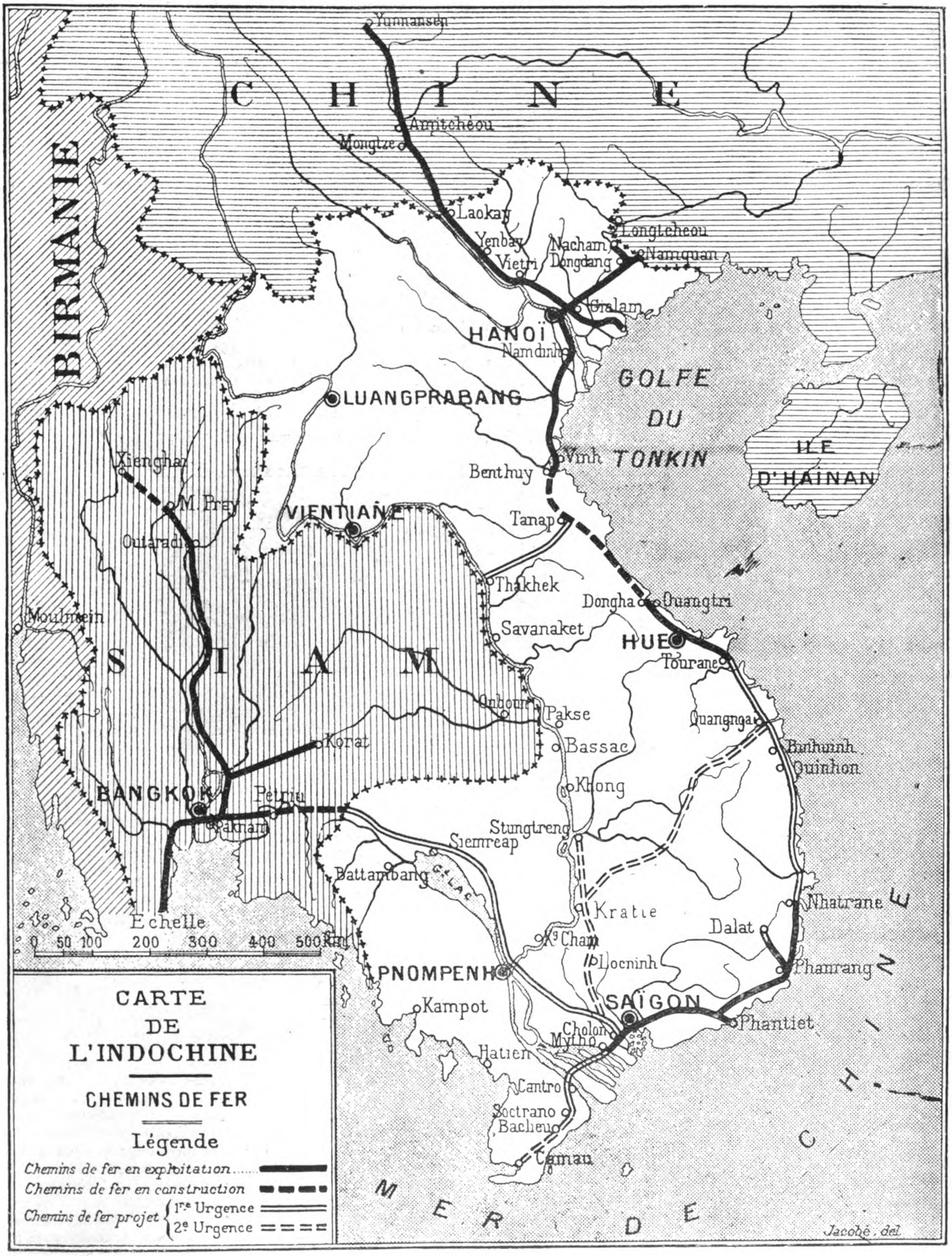
This railway, running through a populous part of Cochin-China, linking up two important towns and finally passing through the Chinese city of Cholon, has by far the most dense traffic of all the railways of the colony.

As it crosses a country cut up by large rivers it contains important metallic structures, built under difficult conditions owing to the nature of the ground.

2. SAÏGON TO NHA-TRANG

From Saïgon this railway runs up the valley of the Saïgon river, which it crosses at Bien-Hoa, through a fertile and well populated level country. Soon after leaving Bien-Hoa it runs over the low but densely wooded spurs from the Annamite mountain-chain, and approaches the coast at Muong-Man, from whence runs a branch to Phantiet, a fishing port and trade centre on the delta of a small river. Thence it follows the coast cutting the mountain spurs separating the valleys of the little coastal rivers, past Phan-ri, Phan-rang (station for Tur-sham) and Kam-Ranh to Nhatrang.

From Tur-Sham a branch, of which 25 miles are already constructed, runs to Krong-Pha and will be prolonged up to the Langbian plateau.


CARTE
DE
L'INDOCHINE
CHEMINS DE FER
Légende
Chemins de fer en exploitation
Chemins de fer en construction
Chemins de fer projet 1re Urgence
2e Urgence
Echelle
0 50 100 200 300 400 500 Km
CHINE
BIRMANIE
SIAM
GOLFE DU TONKIN
ILE D'HAINAN
MER DE CHINE
HANOÏ
LUANGPRABANG
VIENTIANE
BANGKOK
HUE
PNOMPENH
SAÏGON
Yunnansen
Amitchéou
Mongtze
Laokay
Yenbay
Vietri
Nacham
Dongdang
Longtcheou
Namquan
Gialam
Namdinh
Vinh
Benthuy
Tanap
Thakhek
Dongha
Quangtri
Savanaket
Tourane
Pakse
Bassac
Khong
Quangngai
Binhdinh
Quinhon
Stungtreng
Siemreap
Battambang
Kratie
Nhatrane
Dalat
Phanrang
Phantiet
Locninh
Kampot
Cholon
Mytho
Hatien
Cantro
Soctrano
Baclieu
Camau
Xiengmai
M. Prey
Outaradit
Moulmein
Korat
Oubone
Petriu
Paknam
Jacobé. del.

The whole district from Bien-Hoa, including the deltas, is barren. Irrigation works, plans for some of which are already being made, utilization of the forests and increase in the rubber plantations will alone make this line pay sometime in the future.

The lay-out of the line presented no serious difficulty as the spurs of the Annamite mountains could be crossed by easy gradients.

IV.—The Yunnan Railway

This railway which runs from Hai-phong, the great port of Tonkin, for 534 miles to the capital of the Chinese province of Yunnan may be topographically divided into four parts :

The delta of Tonkin,
The valley of the Red River,
The valley of the Nam-Ti, and the Yunnan plateau.

The delta of Tonkin, which is crossed from Hai-phong to Vietri has the characteristics already indicated, viz ; an agricultural country, densely populated and rich. The line runs by the towns of Hai-duong and Jialam (61 miles) where the trains coming from Hai-phong branch off to Hanoï, jointly utilizing for $2\frac{1}{2}$ miles the metals of the Hanoï and Nam-Kwang line ; from Jialam it runs on to Vietri (102 miles).

From Vietri to Lao-kai (242 miles) by Yen-Bai the railway follows fairly closely but without difficulty the windings of the Red River along a narrow and sparsely inhabited valley.

From Lao-kai to the pass of Milati the rails, now in Chinese territory, run up the valley of the Nam-Ti, a tributary of the Red River, and crossing the pass (339 miles) at a height of 5,577 feet attain the Yunnan plateau. The whole region is wild and unhealthy, and the building of the railway was exceedingly difficult owing to this and to the nature of the soil.

The Station at Mytho

From the pass the line descends by a gradient averaging 1 in 62 to the important station of Pi-che-shai (352 miles) in the Mong-tzu district with its tin mines at Ko-Kiu. Soon after passing A-mi-chu (379 miles) it enters the valley of the Pa-ta-ho and runs up it to Yi-liang.

From this town the railway rises rapidly by an average gradient of 1 in 40 to Shue-Tang (480 miles) where it reaches the upper Yunnan plateau, whence, through an almost level country, it reaches its terminus at Yunnan-fu (530 miles).

This last section—more especially close to Yunnan-fu—runs through a generally fertile and populous country thus assuring an important traffic.

II.—Constructional Details

1. Earthworks, Etc

The gauge of the Indo-Chinese railways is 1 metre (3-ft. $3\frac{3}{8}$-ins). This is considered more than sufficient to meet all possible traffic requirements for many years to come.

Gradients never exceed 1 in 40 and the radii of the curves are never less than 100 metres (5 chains).

2. Permanent Way

A. *Rails.*—The steel Vignole rails are laid on broken stone ballast $19\frac{5}{8}$-in. thick and 8-ft. $2\frac{1}{2}$-in. wide on top. They are from 26-ft. 3-in. to 39-ft. 4-in. in length and weigh, according to type, from 13.4 to 18.1-lb. per foot run.

Fish-plates.—The fish-plates, generally of a current type and weighing from 12.1 to 13.2-lb., are attached to the rail by 4 bolts in a single row.

Sleepers.—These are of metal on the Yunnan line and on part of the other railways, and have given entire satisfaction. It is too soon, however, to fix the length of their life.

In the other parts of the colony, and especially in the forest regions, the sleepers are of wood as their first cost is much lower. They are cut from Lim, nghien and sao trees and are generally 5-ft. $8\frac{7}{8}$-in. by 7-in. by $4\frac{3}{4}$-in. and spaced fairly close together. The rails are coachscrewed direct on to them without any sole-plates.

Signals. The Lines are all single and the traffic easy, so that signals and signal regulations—of the usual French type—are minimum.

B. *Buildings.*—The smaller stations are provided with but one building for both passengers and goods, and the line is doubled and has a lay-by siding as well. The more important stations are provided with various types of buildings.

Over the greater part of the railways there has been no difficulty in supplying water, which has to be nearly always pumped.

C. *Gatekeeper's* lodges and living-quarters for staff outside towns and villages there are but few busy roads to be crossed on the level and therefore there has been little need to provide gatekeeper's houses. On the other hand many stations have special quarters for Europeans and for natives.

D. *Fencing.*—This is provided solely in the stations and in certain towns and villages, all the rest of the line being left open.

Equipment

Rolling Stock*

1. *Locomotives.*—The most usual type of locomotive is a 4-wheel coupled weighing empty about 30 tons (1 ton × .984 tons), and capable of hauling 200-ton passenger trains at 25 miles an hour or 300-ton goods trains at 12 to 16 miles an hour.

More powerful locomotives—8-wheel coupled and 40 tonnes adhesion—are used on the long 1-in. 40 gradients of the Yunnan railway.

The proposed Langbian railway will be worked partly by adherence and partly by rack.

Coal is exclusively employed in Tonkin and Yunnan, where this combustible extracted locally, is cheap (from $10 to $15 per ton according to quality). This is supplied chiefly from the collieries of Hongay (a non-bituminous coal), of Phan-Me, in the Thai-Nguyen district, and of Phu-Nho-Kwan to the west of Ninh-Binh. These two latter produce a good bituminous coal.

The Central Annam and southern groups having to obtain their coal from Tonkin, use wood as well, as it is cheaper. The only coal that Tonkin exports is in the form of briquettes from Hongai which cost in September, 1921 $30 per ton delivered at Saïgon, and about $27 at Turan, whereas wood was from $3 to $4.50 per ton.

2. *Passenger Stock.*—With the exception of the Saïgon and Mytho line there are four classes; first and second-class are generally combined to form a mixed carriage, but the most usual type—known as A.B.C.—has 2 first-class, 2 second-class and 4 third-class compartments. There are of the corridor type with seats running across the carriage. There are a few carriages entirely third-class. All the above are used by both Europeans and natives.

*The rolling-stock of the colony is fairly homogenous at the present time, except on the Saigon and Mytho railway, which is of much older construction and where the loading gauge is smaller, the curves of smaller radius and the constructive works built for lighter loads. It therefore has special material, and locomotives and trucks weighing empty over 5 tons from the other railways cannot be run over its lines.

The fourth-class is reserved for the latter and the carriages have seats along the two sides, the centre being free for luggage, such not being carried in the van.

All passenger stock runs on bogies and weigh each about 16 tons.

3. *Goods Stock*.—This is all of the type usual on metre gauge railways and calls for no special remark.

4. *Fixed Works*.—This too calls for no special remark, each group being fitted up on normal lines.

5. *Repair Shops*.—The colonial railways have shops for erecting and repairing, but not for construction, as all metal parts are received from Europe as a rule fully machined. Joinery and body-work, however, is done in the colony.

List of repair shops.

Group	Chief Repair-shop	Branch Repair-shops	Remarks
Northern ..	.. Truong-Thi (1)	Hanoi	(1) 1 mile from Vinh towards Benthuy.
Central Annam	.. Turan	Hue	
Southern ..	.. Dian (2)	Saigon	(2) Between Saigon and Bien-Hoa.
Yunnan ...	... Jia-Lam	Lao-kai-Amichiou Yunnansen	

Management

1. Colonial Railways

Each of the three sections is under a chief sectional engineer and forms a distinct management under the engineer-in-chief, who is directly under the orders of the inspector-general of public works in Indo-China.

A small staff of French directs the native station-masters, inspectors, trainmen, engine drivers, shop workmen, etc.

The finances of the railways are governed by the interministerial order of February 17, 1914 and are as follows :

Every year a railway budget is established outside the normal budget. Its sole receipts are those that it earns.

Besides this, three funds—also outside the normal budget—have been created :

1. A rolling fund consisting of materials and money sufficient to meet the current requirements of the running department. This forms a stores department, everything being obtained through it.

2. A special fund for supplementary works and supplies, out of which are met the cost of all new or extraordinary work, such as renewals and improvements.

3. A reserve fund to cover the deficit in receipts in bad years.

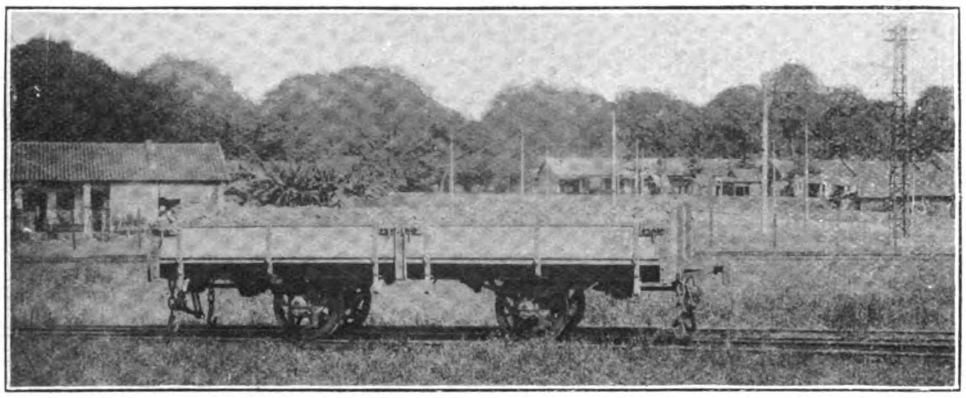
These three funds were created at the start by loans from the reserve fund of the general budget. In normal years this system works as follows : the reserve fund remains untouched ; the stores department, whose payments are all in cash, keeps a stock of stores and money of practically unvarying value while the special fund, out of which extraordinary expenses have been met during the year, is fed by a portion of the year's receipts, the other portion going to the reserve fund.

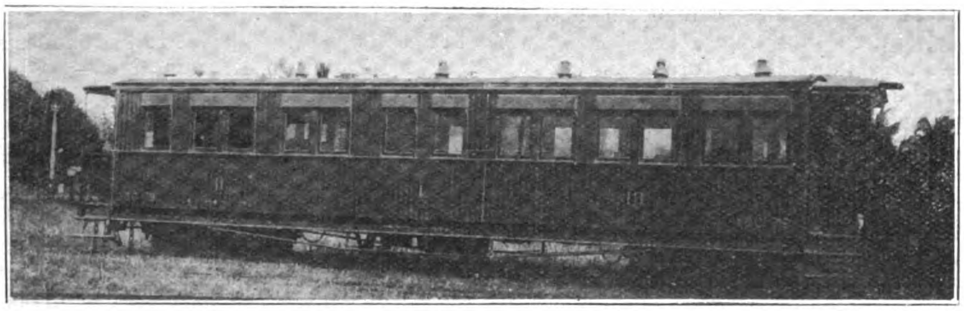
2. Yunnan Private Railway

The management of this line does not essentially differ from that of the colony's own lines, natives being employed as far as possible under the guidance of a few Europeans.

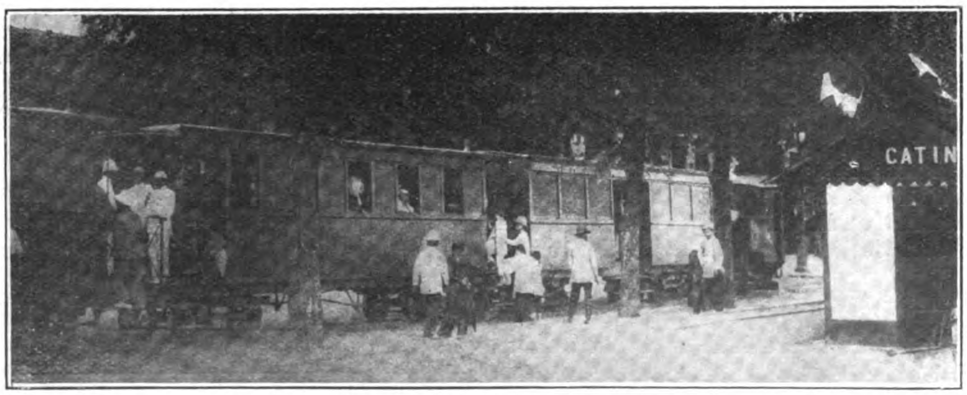
Its finances are regulated by an amendment to the agreement dated July, 1920, whereby the colony undertakes to re-imburse all expenses incurred by the Company for improvements in the maintenance and running of the railway. Before the application of this amendment, which is of five years' duration, the Company's expenses were covered by a system of fixed charges, but this had to be abandoned on account of the varying economic values due to the war. It will probably be re-established at the expiration of the present system, but naturally in a form to meet existing economic conditions.

In both cases, by fixed charge or by direct re-imbursement of expenses incurred, all net running receipts are devoted, first, to meeting certain of the Company's expenses (capital charges and expenses of the central management, etc.) and secondly, what is over divided between the colony and the Company in accordance with the terms of the concession.





Types of Rolling Stock on the Saigon-Mytho Line



Tramway Station at Govap, Cochin-China

Traffic Results

Each year the inspector-general of public works of the Colony issues statistics showing how the railways have been run, the nature of the traffic, etc., from which the following notes on the special trade of Indo-China have been taken.

1. Passenger Traffic

Local Character of Native Travel

As will be seen from the figures given later on, native passenger traffic forms an important item in the receipts.

With the exception of the portion of the Yunnan railway in Chinese territory, the only railways that cover their expenses are those in the deltas of Tonkin, Northern Annam and Cochin-China. These districts are peopled uniquely by Annamites, living for the most part on the cultivation of rice and a few home industries, but generally without commercial instinct.

This extremely dense population (over 777 to the square mile in certain districts) quickly took to the railway and forms actually, a very important class of passenger, but the Annamite, like most peasants, sticks to his native village. It is exceedingly difficult to make him leave his delta for higher districts or to get him to undertake any sort of work, whether trade, industry, husbandry or public works outside his chosen home. He takes the train, therefore, solely to go to market in the nearest town or village where he sells his produce and purchases a few indispensible necessaries, and very rarely undertakes a long journey.

2. Traffic in Local Produce and Goods of Current Consumption

For these same reasons and because the produce of each delta, on which the Annamite is contented to live, is practically the same, there are very few long hauls of goods on the railways.

3. Goods for Export. Competition of Water-Carriage

Sometimes, however, there is a fairly considerable surplus of rice for exportation. The exportation of wood is also well developed.

But the handling of these goods as well as of coal, lime, cement, bricks, etc., is much more cheaply undertaken by water (rivers and sea) and seeing that the railways, as is usual in new countries, generally follow a river or the coast, such competition is fatal to them.

4. Imported Goods

These are handled by the railways, but their volume is still very small as may be expected where industry is just beginning and local customers are not exacting as regards foreign goods. The importance of the traffic to Yunnan in metal goods and in cotton tissues may, however, be noted.

The above reasons suffice to explain the local character of the traffic and the absence so far of long hauls such as might have been reasonably expected. These latter are, however, quite, within the bounds of possibility after the railways have been extended and have placed new and suitable countries within reach of the Annamite population and when industrial enterprises have multiplied. It is quite conceivable, too, that the drainage works of Cochin-China will in due time increase the available land for culture and that the Trans-Indo-China railway, when completed, will bring abundent labour from the less favoured lands in the north.

The Annamite dreads voyages by sea more than those by land, and it is more than likely that, when the population eventually make up their minds to undertake long journeys, the railways will have the preference.

Traffic Statistics

Passengers

In 1920 the railways of the Colony transported 11,500,000 passengers, including 10,900,000 natives, the receipts for which were 5,000,000 piastres, half of which was received from the natives. These figures have been steadily increasing since 1915, when the existing railway system was practically completed.

The following stations show remarkable annual returns for a colonial railway: Hanoï with 2,660,000 passengers yielding $428,000 ; Haï-phong with 800,000 and $106,000 Saïgon with 642,000 and $193,000 ; Hai-duong with 619,000 and $40,000 ; Yunnan-fu with 593.000 and $70,500 and Mytho with 350,000 passengers and $157,000 of receipts.

Goods

In 1920 767,000 tonnes of goods were transported bringing in $2,830,000.

The most important goods stations are : Hanoï with 175,000 tons yielding $352,000 ; Hai-duong with 72,000 and $346,776 ; Saïgon with 123,000 and $100,000*; Yunnan-fu with 49,000 tons and $259,172 of receipts.

The only goods calling for remark are metal goods and textile tissues on the Yunnan railway, which yield respectively $248,000 and $237,000.

* Saigon is placed low in the list of important stations as all the richest lands near-by and in the hinterland of Cochin-China are connected to it by many excellent waterways, but in few cases by rail.

Running of the Trains

As a rule the commercial speed of passenger trains rarely exceeds 15 to 17 miles per hour, and that of mixed trains is about the same, while goods trains travel at about 12 miles per hour.

With the exception of the service between Saïgon and the sanatorium of Langbian and of a daily train between Hai-phong and Hanoï (from 7 to 10 p.m.) all trains run only during the day.

Railway Finances

The total capital invested by the colony in its railways is :

In the railways run by the colony	182,582,973 francs
In the Yunnan private railway	243,068,423 —

The curves given in the appendix show, for the period from 1915 to 1920 inclusive, the general results of the running, the receipts, expenses, etc. for the above two sets of railways.

It will be seen that the net receipts have steadily increased from 155,000 piastres in 1915 to over 400,000 in 1920, showing a very satisfactory development.

Nevertheless the average receipts have never been sufficient to cover running expenses and capital charges. This balance is naturally largely affected by the value of the plastre. It would, however, be a mistake to judge of the value of the railways solely from their balance sheets, for the railways are of considerable commercial importance and, as is equally the case with the roads, contribute to the development of the wealth of the colony.

Further, the railway system is by no means complete. Most of the existing lines are but a part of an as yet unrealized whole and when they are all connected up there is no doubt but that the traffic will be more than correspondingly increased.

Let us examine, for example, the end section of the Hanoï and Vinh railway from Than-Hoa to Vinh. Its local traffic in 1920 amounted to $1,181 per mile, an extremely low figure and comparable with that of the lowest section of the present system, viz that from Turan to Dong-ha ($1,224) which is actually the line the smallest earnings. Since it has been connected up with the railways of Central Tonkin its receipts have, however, attained $4,272 per mile, thus almost equalling the general average.

Furthermore, the present railway system is by no means complete and the following lines are either being constructed or planned for. In construction : the 162 mile long railway from Vinh to Dong-ha which will connect the system of North and Central Annam and thus complete the first half of the Trans-Indo-China trunk line. The work is being actively pushed forward and a part of the cost is being defrayed out of the $6,000,000 loan which has recently been floated, and which met with such signal success among the natives. Proposed : at the same time plans are being prepared for new lines in the south which will fill up the gaps of the Trans-Indo-China main-line between Turan and Nha-trang on the east and Saïgon, Phom-Penh and the Siamese frontier on the west. On the completion of these lines together with another to be carried out by the Siamese government and connecting Bangkok with the Cambodia frontier, it will be possible to go entirely by rail from Yunnan-fu in China to Bangkok in Siam via Hanoï, Hue, Saïgon and Pnom-Penh in Indo-China.

(*To be continued*)

Tokyo Buys 400 New Street Cars

The Tokyo electric bureau is planning to order about 400 street cars from Nagoya. It is expected that the total number of street cars at the end of March will be about 1,200, and the congestion greatly alleviated.

At present, there are about 800 street cars operated in Tokyo. Jitney automobiles will be commenced to be operated on or about January 15 in Tokyo.

Before the earthquake, there were about 1,350 street cars operated in Tokyo.

The authorities will also order 1,000 automobiles to relieve the existing congestion; 300 automobiles have already been unloaded at Yokohama and 300 drivers have received licences from the metropolitan police board.

Reinforced Concrete Freight Cars

Experiments and Designs—Reinforced Concrete Cars are Heavier but Cheaper than Cars made of Iron

By Professor Dr. Ing. Kleinlogel, Darmstadt

THERE can be no doubt about reinforced concrete being generally a suitable material for constructing railway cars. The good qualities of reinforced concrete have been established for many years, i.e., large capacity, rust and fire proofness, small wear and low maintenance costs. Especially the rust proof feature is of particular economic importance in consideration of the great losses experienced on account of the material rusting.

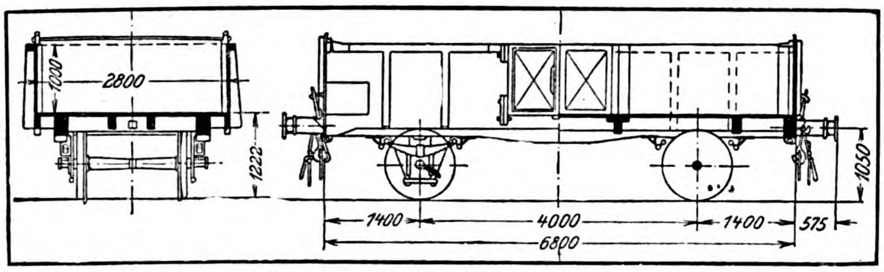


Fig. 1.—Sketch of a 15-ton reinforced concrete car

It is very difficult to make a statistical calculation of the reinforced concrete car due to the fact, that the forces manifested according to position, size, direction and performance are not given, but must be ascertained from observations, approximative calculations and by experiment. To obtain definite figures, so-called buffer stop experiments were undertaken, druing which the forces manifested were measured with great approximation, and the effects of these forces on the reinforced concrete constructions could be ascertained to a degree which provided sufficient clearness. The successful carrying out of the experiments was to a large part due to the praise worthy participation of the Wagon Factory H. Fuchs, Heidelberg.

The very valuable results gained by these experiments provided for the necessary confidence to start constructing the first reinforced concrete car. This was a 20-ton coal car built for the use of the Portland Zementwerke of Heidelberg, Mannheim and Stuttgart. It has now been in service for a long time without giving rise to complaints of any kind. About the same time the Wagon Factory H. Fuchs constructed a 15-ton freight car of the standard open type. This car was submitted to the inspection of the freight car committee of the German states railways, which unrestrictedly approved of the pleasing appearance, construction and equipment. This car was then, at the end of May, 1920, used for making extensive experiments both as regards the resistive power of the fastening of the trimmings in the concrete, and the resistive power of the construction against the shocks and jars it would be subjected to during shunting. The trial car was run with speeds up to 21 kilometres an hour into stop blocks placed on one rail and also into iron cars placed in its way. It was then every time subjected to a careful and thorough examination. During the first experiments, the car was run empty, afterwards it was loaded with 17 tons of ore, The shock was sometimes so tremendous that it could be heard for miles. Notwithstanding, the reinforced concrete frame stood the tests admirably. No alteration in the condition of the fastenings and no crack in the construction could be ascertained.

In the meantime different types of reinforced concrete cars have been constructed, and numerous cars of the trial car type, which had been so well tested, were built.

Naturally, the dead weight of the reinforced concrete car is somewhat greater than that of the iron car, but this will prove to be the only disadvantage of the new type of cars, a disadvantage that will hardly ever be completely eliminated. On the other hand, the reinforced concrete car runs much steadier than the iron car and the essential fact is that all experience tends to show that the wear of these cars is a minimum, and that there is no danger of rusting. The result is that maintenance costs are kept inside very low limits and furthermore that the iron concrete car will *always* be *cheaper* than an iron car of the same capacity and design.

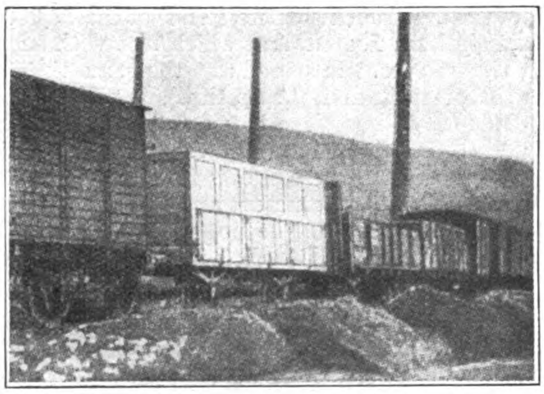


Fig. 2.—20-ton coal car, frame and body of reinforced concrete

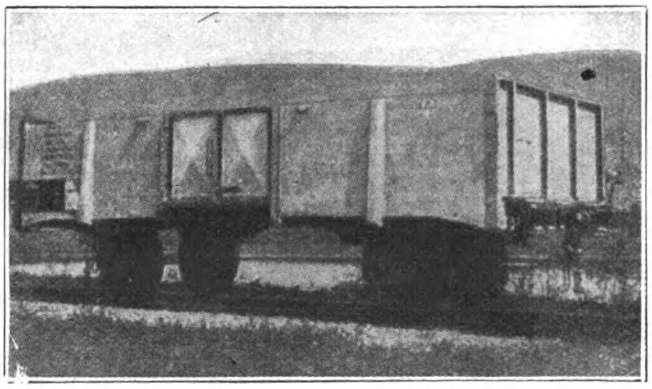


Fig. 3.—15-ton standard type car of reinforced concrete

New Triangular Concrete Bar

Mr. Hirohito Kakuma, of Kumamoto prefecture, Japan, a hitherto unknown architect, has suddenly become famous because of his discovery of how to make a triangular concrete bar, which the architects of Tokyo believe will revolutionize the architecture of the world. It is believed that the government will use the triangular concrete bars in the restoration work.

Mr. Kakuma is 31 years old, and has recently gone to Tokyo from his native town in Kumamoto prefecture in order to demonstrate the usefulness of his discovery. Since his arrival, he has commenced the foundation work of a Methodist church of Nakano, Tokyo, and of other new buildings.

It is said that the features of the bars are first, less time will be needed in building a foundation than when either bricks or ordinary concrete blocks are used ; second, the expense of building a foundation will be decreased from 400 yen per *tsubo* to 150 yen ; it has been found that triangular bars have more power of endurance for an earthquake than ordinary concrete blocks or bricks.

A triangular concrete bar is six feet long, one side is four inches wide, and the other two sides are each three inches wide, a triangular steel bar making the core. The labor required when the triangular bars are used is only one-fortieth of the labor required when bricks are used, and one-fourth of that required for ordinary concrete blocks.

Mr. Kakuma is planning to popularise the use of triangular bars by producing them at 50 sen each.

Shipping Locomotives from the Tyne

BY the courtesy of Sir W. G. Armstrong, Whitworth & Co., Ltd., we are enabled to publish two photographs of unique interest showing the method adopted by this firm for shipping locomotives to India.

The engines, 17 in number, have recently been built at the firm's Scotswood works to the order of the East Indian Railway, and conform to the following specification :—

0-6-0 Type	SUPERHEATED LOCOMOTIVE		Gauge 5-ft. 6-in.
Cylinders	Diameter 20″ / Stroke 26″	Heating Surface	Tubes 917 sq. ft.; Elements 223 „; Firebox 126.3 „; Total 1,266.3 „
Wheel Diameters	Coupled 3′ 1½″ / Tender 3′ 7″		
		Firegate Area	25.3 „
Wheel Base	Rigid 15′ 6″; Total Engine 15′ 6″; Total Engine and Tender 39′ 0⅜″	Weight in working order	Engine 50.95 tons; Tender 40.25 „; Total 91.20 „

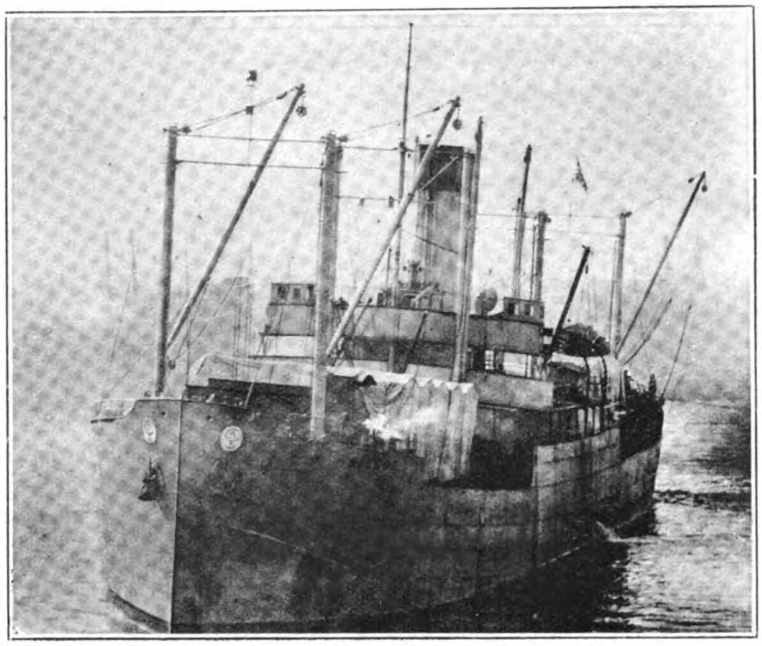
Boiler pressure 160-lbs. per sq. in.
Tractive effort at 65 per cent. boiler pressure 23,000-lb.

Tank capacity 3,000 gallons
Fuel space 7½ tons

Boiler feed 2 G. & C. No. 9.

The first photograph shows a number of the locomotives and tenders in the erecting shop prior to shipment. From this it will be observed that the engines are despatched in running order without any dismantling beyond the removal of the buffers, which is only done owing to limitation of deck space. From this shop the locomotives are taken to the jetty and are lifted by means of a 150-ton hydraulic crane directly on to the vessel moored alongside.

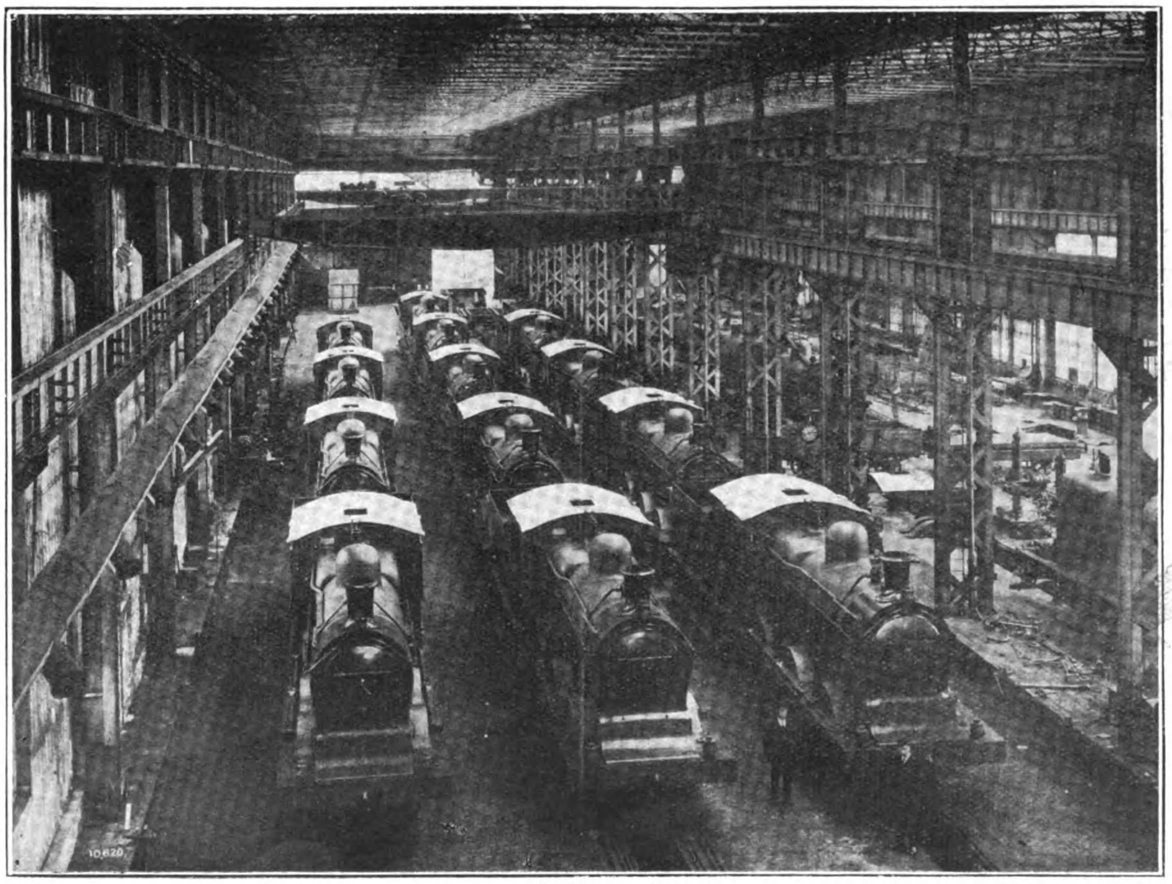
The second photograph shows the steamer leaving the jetty with the locomotives on board. Some of the engines and tenders are carried in special holds and the remainder athwart-ship on the fore and aft decks where they are secured against rolling by means of special shackles. Waterproof covers are provided for the deck-borne engines as a protection against the elments. The engines are fitted with special slings so that on arrival they may be lifted on shore and put into service immediately.



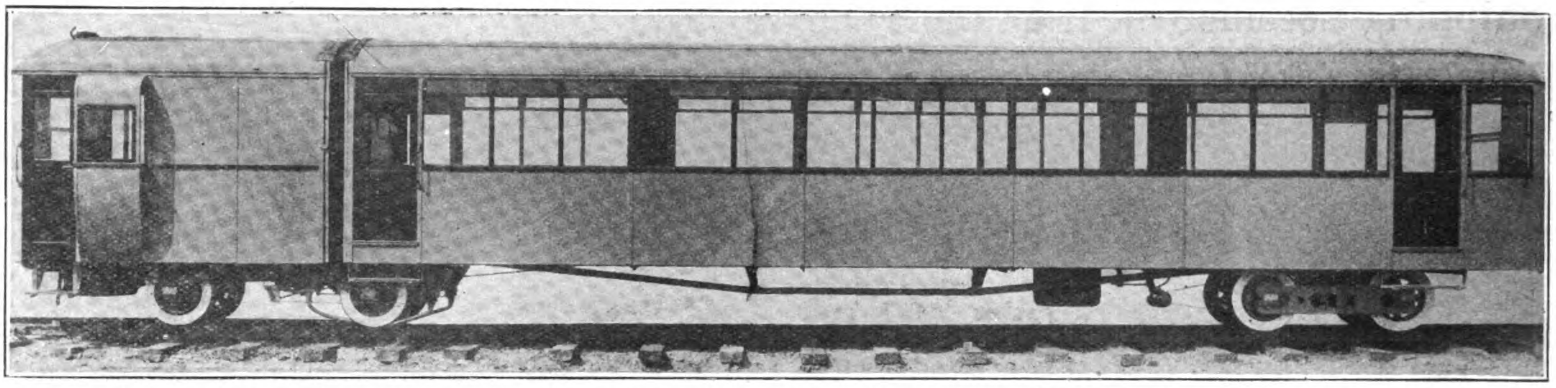
Steamer leaving the jetty with locomotives on board

Sir W. G. Armstrong, Whitworth & Co., Ltd., have already adopted this method of shipping locomotives on a number of different occasions, but hitherto the shipments have been made only to continental and Irish ports. On this occasion, however, shipment is being made direct to India and the experiment is expected to prove the feasibility of this method of despatch to any part of the globe. The advantages to be gained both in time and labor costs are undeniable as the locomotives on being landed are able to commence their useful revenue-earning career without the usual extended delay which shipping in packing cases and subsequent re-erection involves.

The despatch of locomotives complete is especially welcomed at the present moment in India, as all repair shops there are heavily engaged and cannot undertake the additional work of re-erecting dismantled locomotives received from abroad.



Locomotives in erecting shop ready for shipment



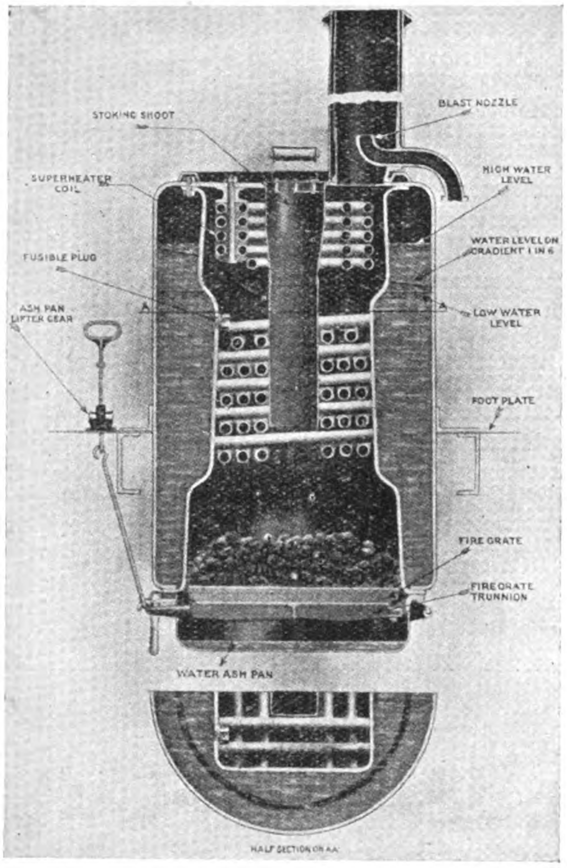
Steam Rail Coach for 50 Passengers.—Built by Cammell, Laird & Co., Ltd., Nottingham, England. Fitted with engine, boiler and controls, supplied by The "Sentinel" Waggon Works (1920), Ltd., Shrewsbury, England

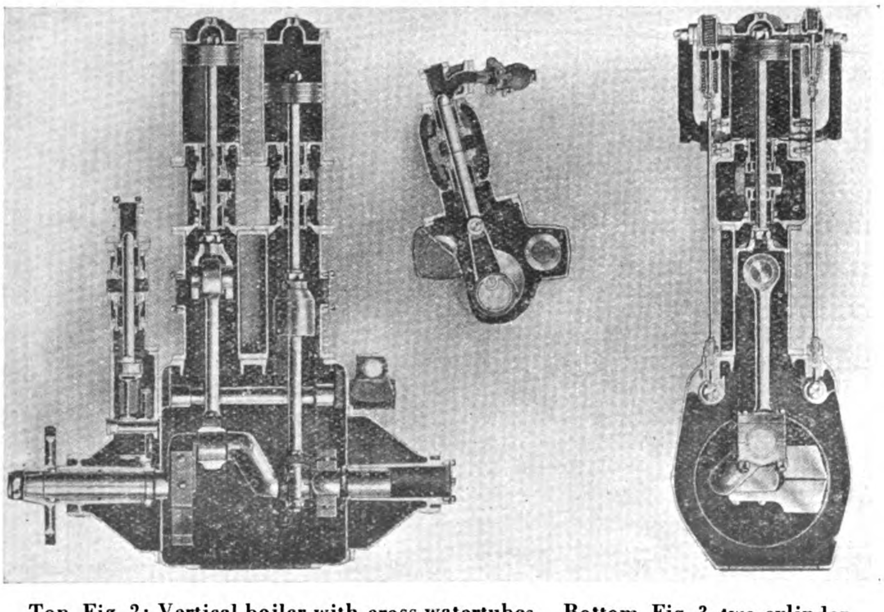
The "Sentinel" Steam Rail Coach

IN the early part of the present century quite a number of railway companies decided to attempt to operate branch line by means of steam-driven cars. The main idea was that such methods would be conducive to lower operating costs than those of ordinary locomotives and rolling stock. After various tests, the results were found in the main to be unsatisfactory from an economic point of view. The chief causes which contributed to the unsatisfactory results were that the weight of the vehicles was entirely out of all proportion to the number of passengers carried, while the motor coaches themselves were found to be too nearly modelled on the lines of regular railway rolling stock.

The railways recognized the difficulties they were up against in competing with road transport for the conveyance of passengers for short journeys and the transportation of goods in small quantities. The old-time methods of dealing with such traffic by means of the ordinary old-fashioned tank engine and coaches was found to be practically impossible to be continued unless at a heavy loss and consequently more economical methods were sought.

Seeing the difficulties that had to be overcome, and recognizing something totally different was required to what was already in existence, two of the leading British firms, both of which had many years of experience of locomotive waggons to their credit, evolved a railway vehicle, equally adapted to both passenger and goods traffic which could be operated at an overall running expenditure of 4d. to 7d. per mile. The higher figure includes the expenses incurred with a trailer and based on a service restricted to as little as 100 miles per day. The figures mentioned include all charges, *i.e.*, fuel, wages, repairs, depreciation, amortization, etc.





Top, Fig. 2: Vertical boiler with cross watertubes. Bottom, Fig. 3, two cylinder double action engine used in driving the "Sentinel" steam rail coach

The accompanying illustration depicts one of these new type vehicles, which is now in use on the Jersey Railways and Tramways Company's line. The line is a 3-ft. 6-in. gauge and is in consequence particularly adapted for rail car operations. The mechanical portion of the work has been executed by The "Sentinel" Waggon Works (1920) Ltd., while the body comes from the work-shops of Cammell, Laird & Co., Ltd.

The power unit itself is self-contained and is easily detached from the rest of the vehicle. It contains the engine, boiler, water and fuel receptables, controls, leading and driving axle, this last named being connected to the engine by a roller driving chain, and adjacent to the engine. A bogie is thus formed by the motor unit, with a wheelbase of 7-ft. It has a pivot to which the body is articulated, while the other end of the coach is carried upon a four-engine wheeled truck with a 5-ft. base. Between the sides and top of the engine cab and coach body there is a flexible connection, in order to render the appearance of the outfit symmetrical in every respect. The motor unit superstructure is made of steel plate with wooden doors, steel pannelled, on either side being a projecting look-out. In order to assist in taking stresses, and for other conveniences, the body of the coach is built integrally with the under frame. The bogie is constructed with side members and cross bars between which a well-sprung swing bolster is housed, the whole being very light and strong. Seating accommodation is provided for fifty-six, the interior being beautifully finished and decorated, as well as excellently ventilated and well lighted.

The boiler is of the vertical type with cross water tubes, central top feed for fuel, and with a coil superheater made out of solid drawn steel tube. The arrangement is shown in diagram 2. It is so constructed that the whole of the interior can be dismounted without in any

way interfering with the external fittings, and notwithstanding its high efficiency as a steam generator, the consumption of coal at most does not exceed 41-lb. per mile. The whole arrangement is simple and economical to a degree. The working pressure is 230-lb. per square inch, and the superheat amounts to 100 deg. F. There is a heater which utilizes the exhaust steam and also insures delivery of the necessary feed water at approximately boiling point.

The engine, which is shown in diagram 3, possesses several unique and interesting features. It has a two-cylinder double action motor, the cylinders being 6¾-in. in diameter by 9-in. in stroke, the admission and exhaust are controlled by independent poppet valves worked by camshafts; these can be moved endwise in order to give the correct distribution for either forward or backward running. Cut upon the shaft is an intermediate set of cams which serve to keep the valves open in the "stop" position to order to drain and warm the engine. This type of valve affords a reduced clearance as well as providing a perfect immunity from leakage; by these means a high economy of steam consumption is secured, which never exceeds 20-22-lb. per brake h.p. and in this respect the engine is superior to many compounds.

Another important feature is that the cylinders and casings for the connecting rods, shaft, etc., are totally and entirely distinct from each other although they can easily be bolted together. The packing glands provide an oil-tight housing for the motive parts and keep them continually flooded with oil but prevent any steam or water from the cylinders reaching them. By means of this perfect lubrication, combined with the extraordinarily large bearing areas which are allowed, extreme durability is insured for all parts which are subjected to wear. This in any event should always be low, as the engine speed is only 240 revolutions per minute at 20 miles an hour, which corresponds to a mean piston velocity of 360-ft. per minute.

The crank shaft, which is very accurately balanced, is made from high carbon steel, while nickel steel is used for the valves, piston rods, and connecting rod bolts, the valves being made entirely of stainless steel.

The pistons, which are lubricated by a positive mechanical oil pump, itself driven by the engine, are fitted with three rings, the pistons themselves being of great depth. The mechanical pump has also another use in that it acts as a feed pump for the boiler supply apart from what is supplied by an injector.

By an ingenious device, the engine timing when reversed, converts the motor into an air compressor, and thus makes a most effective albeit a very gentle brake. Apart from this, however, both hand and steam operated brakes are provided, the drums in connection therewith being incorporated in the track wheels.

Although the power unit denotes great strength, the total weight of both it and the coach is but 12 tons whereas previous rail motors has always varied from 40 to 45 tons. Under such conditions it is easy to see the saving that may be made in the cost of newly constructed lines since it is clearly demonstrated that a 30-lb. rail will be ample for such coaches.

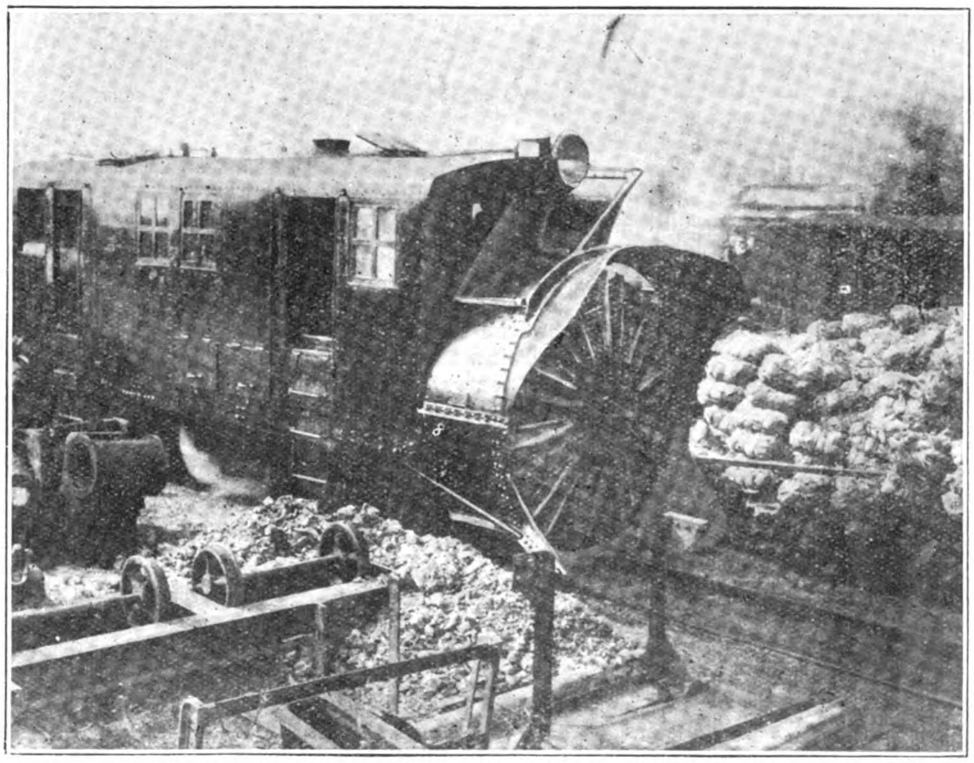
Summed up some of the most salient features of this new rail coach are (*a*) a great reduction in running costs; (*b*) extreme lightness the average weight per passenger being reduced from about 1,650-lb. to less than 500-lb.; (*c*) reduction in fuel and water consumption from 20 to 25-lb. and 18 gallons per mile to 4-lb. of coal and 2½ gallons of water per mile; (*d*) the fact that the sentinel boiler is designed to burn coal, coke, wood or charcoal without alteration, while oil will shortly be added to apply to standard units; (*e*) the enormous saving in costs in laying new tracks due to the lighter class of rails required.

Rotary Steam Snow Ploughs for Japan

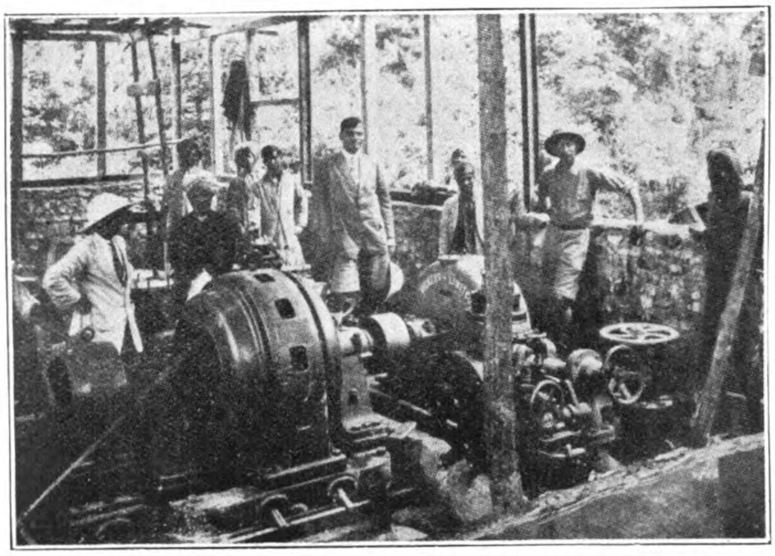
Two rotary snow ploughs have recently been purchased by the Japanese imperial government from the American Locomotive Company of New York as an experiment, and will be fully tested this winter in the heaviest snow country of Japan. If the results of the experiments prove satisfactory, many more will be ordered by the railway department from the makers, and will be used in place of the machines now in use.

Trial operations have already been made with one of the machines in the beginning of November in Kobe, when sawdust was used in place of snow. The rotary snow plough has a steel muzzle, ten feet in diameter, in which is installed a big drill fitted with ten double-bladed steel propellers, averaging sixty revolutions per minute. The plough is fitted with a 400 horse-power steam engine. The body is 12½-ft. long and weighs 60 tons; the cost is between 140,000 and 150,000 yen.

One of these rotary snow ploughs will be sent up to Hokkaido and the other to the Tohoku district in the northern end of Japan proper for winter testing.



Rotary Steam Snow Plough, manufactured by the American Locomotive Company for the use of the Imperial Japanese Railways in the Hokkaido. These ploughs were set up at the Takatori shops and trials made by ploughing piles of sawdust.



One of two 143-hp. Vicker's Impulse Water Wheels coupled to 6-pole, 100-kw., 3-phase, 50-period, 2,200-volt Water Wheel Alternators, in course of erection at Shillong Hydro-Electric Station

Hydro-Electric Installation

THE hill station of Shillong-Assam is situated 5,000-ft. above sea level, and a town lighting scheme supply from a hydro-electric installation is now being erected there.

The plant consists of two 143-h.p. single section governing impulse water wheels by Messrs. Vickers, Limited, model No. 95. The discharge is 2.95 cubic feet per second with a net head of 546-ft. Each wheel is fitted with nozzle hand control and oil pressure governor with the necessary governor connections and drives.

Each turbine is also fitted with a pressure gauge and a speed indicator. They run at 1,000 r.p.m. and are each coupled to a 6-pole, 100-k.w., 3-phase water wheel alternator, 50-periods, 2,200 volts with overhung exciters pedestral bearings and bedplate.

The photograph which we are able to reproduce shows the station in course of construction. Judging from the background of trees, it would seem to be situated in a very pleasant spot.

S.M.R. Industrial Developments

ACCORDING to H. E. President Kawamura, of the South Manchuria Railway, the estimates of the S. M. R. Co. for the next fiscal year are now completed. The total development funds, as asked for by the different departments, reach Y.80,000,000. How far this total amount will be cut down is unknown, but may probably be reduced to the neighborhood of Y.40,000,000 in the end.

In the above amount is included the sum of Y.7,000,000 for the first stage expansion program of the Anshan Iron and Steel Works. The company is heartily desirous of carrying out the program. For the succeeding fiscal year, 1925, Y.4,000,000 is proposed to be set apart.

While the starting of steel manufacturing depends upon the results of the investigations now in progress, President Kawamura is personally strongly inclined to embark upon that line of enterprise. The president appears most sanguine about the technical value of the new hematite reducing system of treating poor-ore, which constitutes the major portion of the Anshan iron vein. His excellency seems also satisfied of the commercial feasibility of this system.

The president has also given out that the company is now going to give more attention to the fostering of all kinds of industry in the S. M. Railway area and in Manchuria in general. The enthusiasm awakened among the Chinese towards industrial activity in recent years is wonderful. The spinning mills newly founded at Mukden may be mentioned as among the most promising. A soda factory has been established at Tientsin. Then at Chinwangtao a glass factory has been brought into being on a large scale. Behind all these ventures there is always competent foreign counsel and guide. The drafting of the plans and specialists, while gether with the installation of machinery, etc., has been attended to by foreign specialists, while these plants are kept going under superintendence of Chinese experts. Many of them have graduated from Japanese colleges. The present boom in the industrial China reminds one of Japan of about 26 years ago.

The S. M. R. Co. has asked Dr. Nishikawa, of the Kyushu Imperial University, to come over to the Kwantung leased territory for a professional study of the ground as a site for alkaline industry. Whether the same industry has an economic workability or not still remains to be seen, and awaits a verdict by Prof. Nishikawa. Supposing the verdict is rendered in the affirmative, whether the establishment of the same venture shall be undertaken by the S. M. R. Co., under private management with the company's backing, also remains indefinite.

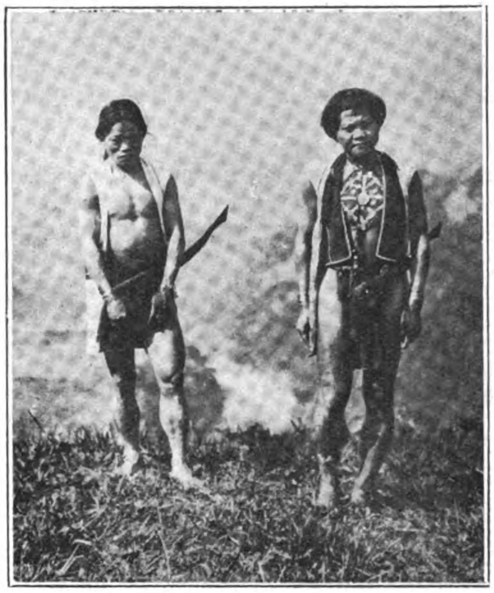
The Kowloon-Canton Railway

HONGKONG'S one and only railway seems to be falling from grace. It is a well-laid line, with substantial road-bed, broad gauge and heavy rails—in its way a model railway—and Hongkong has never regretted having built it nor having encouraged the Kwangtung authorities to make the connection with Canton. The British section of 22 miles, with the seven miles branch to Sha Tau Kok, was commenced in 1906, and the Chinese section in the following year. The capital sunk in the British line is put now at almost $16,000,000. The Chinese section (89 miles) has cost to date about the same sum, the money having been raised by loan to which British sources contributed. The Chinese end has never been particularly profitable, constant warring interfering with the traffic. The same causes have naturally had their effect on the British section, and despite careful management our 29 miles of track have not exactly made them rich. The net earning in 1921, to take a more or less normal year, was $75,989.71; but expenditure for that year totalled over a million dollars and revenue only two-thirds of that amount. The year 1922 showed a better balance, due partly to the increased traffic resulting from the seamen's strike, and partly to a reduction of special expenditure. For this year revenue and outlay were expected almost to meet, but again China's politicians have made the railway their sport, and a more than ordinarily severe typhoon has upset calculations. The capital sunk in the line is steadily mounting up and there is considerable justification for Mr. Lang's criticism in council that the undertaking is becoming an expensive item. The colonial secretary could only assure Mr. Lang that: "We have to keep it efficient in the hope that some day the Chinese section will also be efficient," and as to money expended for the Chinese section,he could not hold out much hope of recovery. Obviously, as was remarked, we cannot abandon the line: is it not to be the Oriental terminus of the wonderful iron way from London? Nevertheless, the position of waiting and hoping and spending is far from satisfactory. If Kwangtung became peaceful and if branch lines were built to open up nearby mineral and other areas, we need not worry; but before then many more typhoons must be voted for, and much Chinese suspicion removed. If we are to avoid interminable drain on our funds, it is time the government attempted to make our 29 miles support themselves as an independent unit. As between operating costs and income the balance is on the right side: it is the special expenditure that is running away with our money. For this year no less than $465,007 has been estimated, including $60,000 for extension to workshops, $100,000 for locomotives, $88,000 for a breakdown crane, $42,857 for boilers for locomotives, $32,500 for extension to carriage shed at Hunghom, and much more. Many of these things may be called for by efficiency, but perhaps not all. Under the circumstances the government might well apply the axe for the present, and as to the future, we would repeat our remarks of a few weeks ago on the subject of the development of the new territories. At present the railway practically depends on passenger traffic: there is no inland industry of sufficient importance to feed it with goods. If capital can be encouraged to take itself away from the city centre, it will be good for the railway, perhaps calling for several short branch lines, and good also for the community generally.—*Hongkong Telegraph.*

Administration by Electricity

(Continued from page 16)

According to their lights the Japanese have done their best. They have spared no pains to bring this region of swelling jungle hills under their influence. They have spent large sums of money. They have sacrificed many lives. They have tried both the method of 'suppressing' the uncompromising head-hunters and that of 'developing' them alternately. They have not treated them barbarously, as the Chinese did; on occasions thay have been unduly severe—Mrs. McGovern, for example, in *Among the Headhunters of Formosa*, mentions bombs being dropped from aeroplanes on defenceless villages—but once the natives have come under government influence they have treated them well, even though they persist in the 'assimilation' principle. The trouble is that after nearly thirty years there are so many natives who refuse to come to any sort of terms.



Taiyal Natives of Formosa.

The Japanese have met with extraordinary success in every commercial, industrial, economic and scientific enterprise they have undertaken in Formosa. Why they have failed in this one essential thing, the settlement of the native population ?

I believe the chief reason is lack of sympathy. When the Japanese first came to Formosa they were quite inexperienced in matters of colonial administration. They were confronted with problems thay had never been called upon to solve before. Most of these they learnt to solve, simply because they were not too proud to learn from others how to solve them. Some might say that they sent commissions and individuals to pick the brains of other governments, but the fact remains that they learn what they wanted to know and, what was more, put their knowledge into practice.

But there was one thing they did not learn, and that was how to deal with a primitive people, whom oppression had rendered intractable and truculent, such as those of the Formosan hills. Perhaps it was because they had so many other things to learn that this one thing was overlooked. Perhaps they thought it needed no learning. I am inclined to think that they underestimated its importance and despised the problem. They had an army; a battalion or so could deal with a handful of natives; that, I imagine, was what they mus have thought. They made the mistake of underrating not only the strength but also the indominable character of those pagans with whom they had to deal. In fact they never looked upon them as anything but a nuisance.

I talked to many Japanese officials on this subject when I was in Formosa and they all gave me the same impression, they all looked at the question from the same point of view. The natives were an obstacle in their way; they despised them as 'savages,' even though by then they had come to learn that savages can be a power to be reckoned with. They seemed to have no faculty for making friends with the native tribes : the thing never seemed to enter into their heads.

Working-class people, when they have got on in the world, not infrequently look down upon those who were once their equals, while persons whose station in life is above both would not think twice of talking to either in a friendly way. This, and I say it without any intention of giving offence, has been the position of the Japanese. They have not been a ruling race long enough to unbend to those who come under their sway. One may see exactly the same thing when a European labourer or mechanic, who has had no previous experience of handling men, goes to a good position in the East and finds himself in charge of a number of natives. There is always the danger that he will look upon them as 'blacks' or 'niggers' and will treat them, not perhaps with actual cruelty, but as creatures so far beneath him as to have no claims upon his sympathy or consideration.

A Taiyal Grandmother.

And I say deliberately that although the Japanese have not treated their Formosan natives with actual cruelty, they have not treated them with sympathy. Even those with whom they have come to terms they are 'assimilating' ; they are teaching them the Japanese language and instilling into them Japanese customs, not realizing that these pagans for whom the have made themselves responsible have a perfectly good language and perfectly good customs of their own. If you wound the individuality of a race you wound its very heart, and its death is only a matter of time. The Formosan government makes its natives learn Japanese rather than send trained administrators to learn the native tongue; they are destroying the spirit of the pagan race rather than fostering it. That is why the pagans are slow to surrender to Japanese influence ; that is why the Japanese have failed.

It may be of interest to see how, if the Formosan government adopted other measures it might achieve better results. When the British North Borneo Company acquired its territory, the size of Scotland, 44 years ago, the country was in very much the same condition as the Japanese found the hills of Formosa. The natives had long been oppressed by the coast Malays. they were suspicious of strangers, they waged unceasing warfare amongst themselves. There was uo semblance of orgcnized government. The cheapest thing in Borneo was human life. The country was a tropical wilderness ; there were no roads and, save for the clearings of the native tribes, the jungle was everywhere. Yet a handful of European officers and a small force of Indian and native military police, with no wealthy treasury behind them, within ten years had brought the greater part of North Borneo under government influence and so administered the native tribes that the jungle paths are as secure as the pavements of Pall Mall. The headhunters have ceased to raid and live at peace. The natives thrive and increase ; they are treated with sympathy and understanding; their rights and customs are respected. Thay look upon their district officer as their guide, philosopher and friend. They bring him their cases to try, they go to him for medicine, they even ask him for advice about their erring wives. All this has needed patience, tact and courage to accomplish, but it has been done. Given the right men to do it I believe that it could be done in Formosa to-day.

The Japanese did make some experiments in this direction soon after the occupation, but unfortunately they did not go far enough. Officers were established along the native border so that they might get into close personal touch with the tribes, learn their language and customs and gain their confidence. But instead of making these posts attractive and well paid and entrusting them to men of proved administrative ability, the government apparently considered them of minor importance and to fill them appointed subordinate officials whose status and pay were little better than clerks. The experiment did not turn out a success

and was abandoned in 1898; the control of native affairs has been in the hands of the police department ever since.

This, obviously, was not the way in which the problem could be solved. In dealing with native races it is not so much the system which counts as the man. Natives are little more than children; in fact when dealing with them one is dealing with a race in its infancy. So that a native should be treated not as 'savage' but rather as a child. He has the same quick prejudices, the same instinctive likes and dislikes, the same fears and superstitions and wild terrors as a child; he is as easily moved to hatred or resentment or sudden mistrust as he is to laughter or affection. His mind is wax, quick to receive impressions; he will meet cunning with cunning and courage with respect, and he expands to sympathy as a flower to the sun. Discipline, as we know it, is alien to him and must be enforced gradually. He resents complusion; threats provoke him and trickery arouses his hatred. And how can he look upon a mine or an electrified wire as anything but a trick?

I am no believer in the pampering of the native. A native appreciates justice and firmness: these are the foundations on which to build, but one must use the mortar of humanity. This is all the more necessary with the Formosan, who has been so barbarbously treated by the Chinese for centuries that he is become like a baited dog, ready to turn even upon those who would be his friends.

Even so there is evidence to show that the Formosan pagans, when approached and treated in the right way, are not the uncompromising people the Japanese sometimes make them out to be. There is the evidence of the Dutch and other Europeans to show that they were tractable in their dealings with white men, and quite recently Mrs. McGovern was ab.e to go about amongst them in spite of the warnings of the Japanese authorities. If the Formosan government asked to-morrow for twenty young Englishmen with experience of administering native races they would get the men to send into the Formosan hills. They would probably have thousands to choose from and I believe that in this way the whole of the 'savage' area would be settled in five years. But the solution does not lie there. Japan is too proud now to allow another race to do for her what she has failed to do herself. And rightly, for every nation must solve her own problems.

The task which Japan has begun she must bring to a conclusion. She can only bring it to a successful conclusion by getting her best men, sending them to another colony, such as North Borneo, where similar conditions prevail, to learn proved and tested methods of administration, and, once they have learnt their lesson, send them to serve as district officers to govern the native districts of Formosa. They must be volunteers, for there can be no pressure for such service. They will have to sacrifice comfort, perhaps health, some of them perhaps even their lives. But theirs will be work worth the doing and they will have their reward. They will learn to live amongst these primitive people, speaking their language, becoming acquainted with their customs, gaining their trust and teaching them the benefits of living under a just and benevolent administration. They will travel across those jungle hills from village to village, as a district officer travels in Borneo, attended only by a policeman or two, sleeping in the native houses, trying cases, adjusting disputes and making friends. The3 will find a way of settling the existing head-hunting feuds by the payment of blood-money, inducing age long enemies to make peace by swearing solemn oaths in their own fashion—oaths which once sworn they will find will not be lightly broken, for even a pagan knows how to keep his word. They must respect native prejudices and traditions; they must see to it that their people are not exploited—that their rights are recognized and safeguarded and, if the districts are opened up, that natives reserves are made and that their lands and other property are not wrested from them by unscrupulous traders or speculators. Wherever they go they will plant seeds of confidence, and gradually good feeling will spring up and they will find that these once truculent savages will come to them not only to have wrongs put right but to ask their advice on the little troubles of every day.

I do not pretend that it is likely to be plain sailing. There will be failures, there will be disappointments, there will be dangers. There may be outbreaks of head-hunting; there may be native risings which will be troublesome to put down. But in the end I am confident that the right men well succeed, just as I am confident that by this means along, short of the extermination of the aborigines, can the land the given peace.

Once the foundations of such an administration have been laid let the government abandon the policy of 'assimilation.' Assimilation in the long run means nothing but the fading of a native race and the object should be to make it bloom. Let education, anyhow at first, be voluntary; let the natives preserve their own language, their own ways, their own ideals. Let native courts be established under the supervision of the district officer to deal with cases involving breaches of native law and custom: as far as is consistent with humanity let the people be judged by their own standards rather than by those of an alien race. Let a police force be recruited from the native tribes, so that each policeman with his uniform and his rifle forms a bond between the government he serves and the village from which he comes. Let natives chiefs be chosen from the tribes and set up by the district officer in position of authority; but let the district officer be careful whom he trusts, lest he gives power into the hands of the wrong man; for among so primitive and so impressionable a people one traitor in authority may undo the work of years. Above all, let him remember that these brown people of the hills have a tribal spirit and tribal traditions of their own and let him be glad that they should keep them, for they will be happiest, and so most easily governed, when they are allowed to live their own lives once they are at peace.

Thus may the district officer come to know and to understand—and perhaps to love—the people he is sent to rule; thus may he have his finger upon district's pulse until he is so in tune with its beating that, like a mechanic with his engines, he can tell by instinct if anything is going wrong.

All this is not visionary; it is not Utopian. It has been done, and it is being done, elsewhere. I shall never believe that Japan cannot find the men who would do it too. And it will be well for those simple people of the Formosan hills and well for the Japanese themselves, when the imperial government realizes that one good district officer who can dominate and influence his natives in the right way is worth more than a battery of field-guns and a hundred miles of electrified wire.

The Changing Chinese

(Continued from page 12)

toward foreigners. But in reality this condition is wholesome both for Chinese and foreigners. It will make foreign officials less arrogant and will thus prevent those constant little pin-pricks which impede the development of friendly relations due to tiny men getting jobs which in their own countries would entitle them to a seat below the salt but which in China places them to the right of the greatest official. Furthermore, foreigners like to know exactly where they stand. All this scraping and bowing and polite language gets one nowhere. If there is opposition, the closer it is to the surface, the easier it will be to handle it and to prevent it from becoming bitter and chronic.

The Chinese are changing. They are changing all the time. They are becoming their own masters and are learning to do modern things in a Chinese way. They realize they cannot be fought by armies and navies and so they are taking their time in making changes. They are in no hurry. If it takes a decade to make China modern, let it take a decade. If a century, let it take a century. If the foreigners don't like it, let them trade elsewhere, they say. The logic of the situation is with them, for China trade is still good and everyone wants to be in it. A few old-timers get peeved every once in a while at the conduct of the Chinese but as long as business is good, one says very little about them that is unfavorable. When business is bad, there is a howl about bandits, pirates, robbers, inefficient government. When business is good one enjoys the spectacle of the civil war as one enjoys Charlie Chaplin. Meanwhile, China moves and is changing. And as long as this process goes on, with its actions and reactions, its pleasant symptoms of progress and its unpleasant realities of slowness and uncertainty, China is on the road to better things. It is the nation which stands still, the country, permeated with dry rot, which is on the road to her end. There may be plenty rotten in China, but even the form of rot is changing.

Rubber Growing in the Philippines

HARVEY Firestone, president of the Firestone Tire and Rubber Company, attacked the British act restricting the production of rubber, at a meeting of the foreign commerce group of the chamber of commerce of the United States. He declared that the American rubber industry should no longer be dependent upon foreign countries for a supply of its raw material and suggested that the United States should produce its own rubber in the Philippines.

Mr. Firestone declared that there was a crisis in the rubber industry, due to the restriction of production and the increased demand because of the rapid increase in this country in the use of the automobile and motor truck. During the war, he said, the United States could not get a pound of rubber, except by consent of the British government, and he had no complaint regarding the manner rubber was obtained during that period. After the war, he added, a British committee, headed by Sir James Stevenson, was appointed, with the result that the committee recommended to the British colonial office the adoption of what came to be known as the Stevenson committee act.

"Before the adoption of this act," he continued, "it was generally understood that certain interests contracted with the planters in the Dutch possessions (who had refused to join in a proposed restriction of production agreement) for all the rubber they could obtain during the next two years. The Stevenson restriction act proposed to reduce the production of rubber to 60 per cent. of normal, considering the output of 1920 as the basis, which gives the world's production at 330,000 tons. Applying the Stevenson act, the world production for 1923 would be 265,000 tons. A very conservative estimate of the world's consumption in 1923 is 400,000 tons, leaving a shortage of 135,000 tons, or over 50 per cent., provided this restriction act is adhered to according to the law as enacted.

Declares it is More than Tax

"The British restriction act is often called a tax on rubber. This is misleading. While the legislation mentions only restriction upon exportation, it in effect restricts production and is not sufficiently flexible to remedy a shortage of supply which is sure to result under its provisions. It must be borne in mind that this restriction scheme is for the purpose of restricting production, creating a scarcity and enhancing the price of the product for the benefit of a small group of plantation shareholders in London."

Mr. Firestone said that the restrictive act should have received greater criticism in the United States, which uses more than 70 per cent. of the rubber produced. Passage of the act., he said, aroused great opposition in England and its rubber-growing colonies. He explained a drop in the price from 35 cents to 29 cents a pound during February, March and April on the theory that the rubber growers, through the British colonial office, either could not control the rubber-growing possessions or did not want to control them for fear the price would go too high and the restrictive act would have to be repealed. "My personal judgment is that it is both," he said.

"We have men in England and in the British and Dutch possessions watching the situation very closely and the rubber growers' association is very much concerned as to what may happen to the restriction scheme. The rubber growers' association has a propaganda fund of £40,000 ($200,000), purported to be for the development of new uses for rubber. The rubber association of America also has a propaganda fund, purported to be for the correcting of any misstatements and quieting any misapprehension concerning the restriction act. These two organizations, the former in England and the latter in America, are very powerful financially and politically and it would seem that they could carry out almost any program they desired.

"I have endeavored to present to you a picture to enable you to visualize the importance of rubber and the critical position our country occupies in connection with that product. Authoritative figures show that the amount of rubber consumed in the United States in 1904 was 26,346 tons; in 1910, 42,000 tons; in 1915, 112,594 tons, and in 1920, 248,791 tons. It is estimated that in 1923 we will use 325,000 tons. If we hope to continue to increase our development of highway transportation we must look forward to a new source of rubber supply."

Advocates Philippine Production

Mr. Firestone said that the United States departments of commerce and agriculture were starting an extensive survey with a view to America producing its own rubber in the Philippine Islands, South America, Central America, Mexico and even the continental United States. He declared that newspaper statements that rubber could not be produced successfully in the Philippines were due to hostile propaganda, for the purpose of upholding the present restriction program and preventing America from establishing her own sources of supply.

"The fact of the matter is that the Philippines offer exceptional opportunities for the growing of rubber," he said. "This statement is substantiated by government officials who have made a close study of the situation and by others interested in seeking the proper development of the islands.

"The growing of rubber in the Philippines is no longer an experiment. Nearly 100,000 trees are to-day being tapped on Basilan Island, and several hundred thousand more trees will soon begin to yield. There are about 200,000 Castilloa rubber trees growing wild in Mindanao. The Agusan Valley of Mindanao a vast fertile area of 4,000 square miles, offers inducements that are immeasurable for the growing of rubber.

"With certain changes in the land and labor laws the Philippines will be a grand garden spot for the growth of rubber, promising to excel the Malay Peninsula and other regions now prominent in the industry.

"What is needed to bring about this great transformation is capital, and I urgently appeal to America to raise that capital so that this country eventually will be free from the foreign grip now held on the production of a commodity of vital importance to the public."

Railroad Expansion in Dutch East Indies

THE new standard gauge railroad under construction in Dutch Borneo from Martapoera to Bandjermasin, a distance of 40 kilometres, is being pushed toward completion. The work is being done by the Samarang-Joana Tramway Company, which already has several hundred kilometres of standard gauge track in operation on the island of Java.

Bandjermasin, which is reached from the sea on the Barito River, will soon be connected by this railway with Martapoera, which is the centre of the native diamond industry and lies in one of the richest sections of Borneo.

A second railroad is expected to be constructed soon, as plans and details have long been worked out, and in fact was much earlier under consideration than the one now nearing completion. This new railroad is to connect the rich regions of Sambas on the west coast by way of Singkwang, with the residency Pontianak, a distance of about 160 kilometres.

On the island of Celebes railway construction on the line from Makassar, the principal town in the south, going south to Takalar, 45 kilometres along the coast, is progressing. All grading, earthworks, bridges and culverts have been completed.

Plans for another line running north from Makassar are well under way.

Sumatra is showing greater activity in railway building than any other island of Netherlands India. Communication is being rapidly established between Telok Betong, in the extreme south with Palembang toward the east.

The crossing from Java to Sumatra by the boats of the Koninklyke Paketvaart Maatschappy, is, of course, the most difficult part of the entire trip and as long as present conditions do not change, six hours will be required for the 100 kilometres that are separating the two islands.

The Netherlands harbor works is also completing for the government, a railway 40 kilometres in length between Moeara Enim to Iahat. Steam shovels were used on this construction for the first time in Insulinde.

Steels Used in the Textile Trade

A Few Notes on Selection

By H. Scholey

THIS subject is one which has always strongly appealed to the writer of these notes, and when, considering the very primitive methods of our forefathers of making up wearing fabrics, it is very impressive to note the progress that has been made in the manufacture of the plant and machinery used in the present-day mill. The wonderful looms and spinning machines of to-day are a credit to the British engineers who have evolved these uncanny machines from the humble but nevertheless far-reaching invention of Arkwright.

In this connection spindles come into one's mind most readily, but there is a great variety of components other than the spindles used by this industry, and the steels which are taken for the various parts will be commented upon later. However, to make these comments as brief as possible, we will commence with a few observations about the aforementioned spindles.

Spindles.—These may be divided generally as follows :

(*a*) Roving Spindles.
(*b*) Mule Spindles.
(*c*) Cap Spindles.
(*d*) Loom Spindles.

These are usually supplied in the best Sheffield doubled reeled finish, but in certain instances makers prefer bright drawn spindles. Perhaps the ideal steel for roving spindles is one that has a carbon content of 1.10 per cent. to 1.20 per cent., but there is no hard and fast rule here, as various makers have evolved from their own practice certain variations from this, and one would find manufacturers going down in carbon content to .80 per cent. or .65 per cent. in the very large sizes.

Regarding mule spindles, there is not so much diversity in the practice obtaining with regard to the steel used. Generally speaking, a harder steel is taken because of the small sizes required and the rigidity that is demanded of all really good spindle steels.

Cap spindle steel is one which must be very rigid, and steel with carbon content of 1.20 per cent. is found to give the best service.

Loom spindles are usually made from steel containing about .90 per cent. to .95 per cent. carbon.

It should be noted that the afore-mentioned refer chiefly to spindles used in the cotton and woollen trades. The more experience one has of the steel used for spindles, the more it is realized how differently various manufacturers select their steels. One notices that very often some of the best makers steadfastly adhere to crucible steel for their spindles, and in this they no doubt act very wisely when purchasing from a reputable maker. Since the advent of the Siemens process a great quantity of spindles have been made from this class of steel, and in the writer's opinion, a really high grade Siemens steel is to be preferred to the crucible, inasmuch as a large bulk of steel of one uniform analysis can be obtained and more regular results assured to the ultimate user.

The next point that occurs to one's mind is the tendency to introduce bright drawn steel in order to economize in the production of the finished spindles, and one cannot avoid thinking that this is a serious mistake. The writer feels that nothing like the same service can be obtained from this type of drawn bar as compared with the blue reeled steel of the proper temper throughout. The reason for this opinion is that it is usual, when supplying bright drawn steel for spindles, to take a medium hard steel, and in order to facilitate the drawing, this has to be annealed, and although the finished product may appear stiff and rigid, this is usually not more than a mere skin hardness. Consequently, the wear when in use is much less than is the case with the older and much more satisfactory blue reeled bar. This point will no doubt be appreciated when considering the high running speeds of the spindles and the strain that is placed upon them in carrying heavy bobbins.

In the writer's opinion there is no doubt that the rigidity of the spindle and its readiness after any undue strain immediately to resume its position in true alignment is a very important factor. Quite a number of makers test their spindle steel by placing it in a holder, leaving one end free, and subjecting the free end to a given bending strain. On releasing the pressure the permanent deflection should not exceed one-hundredth of a millimetre. Of course, the bending pressure imposed is fixed in ratio to the size of the bar.

Flyers.—Three classes of steel are used for making flyers, which may be set out as under.

Spinning Flyers.—Two tempers are usually taken for this type of flyer, some makers using a high quality steel of about .60 per cent. to .65 per cent. carbon, and others a steel ten points lower. The essential feature of this class of steel is that it shall forge or smith easily into the form of these components. The feature most desired, as in most texile steels, is material which is exceedingly clean to machine up.

The Standard Type of Flyer.—This is an exceedingly difficult article to produce, and the resultant flyer is a credit to British workmanship and the smith's art in particular. Despite the splendid skill and workmanship which is embodied in one of these articles, the great thing is to have a suitable medium with which to work, as the steel used has to stand the severest forging treatment, yet it must be when finished, ground and polished, flawless, and absolutely free of all minute surface or subcutaneous imperfections. The point the writer emphasizes respecting flawlessness will be justly appreciated when it is borne in mind that in our great mills containing thousands of machines, constant stoppages caused by the breaking of fine strands of cotton or thread due to minute imperfections in the steel (usually invisible to the naked eye) would be fatal. What then, may one ask, is the ideal steel for this purpose, and to this it is difficult to give a ready answer. However, one can give one's own experience of the steels found to be best suited to the purpose.

(1) First on the list comes a good dead soft Swedish steel of approximately .08 per cent. to .14 per cent. carbon, but owing to the demand for a cheaper article which answers well, this very suitable steel has been largely replaced by.

(2) English Siemens steel of similar composition to the Swedish afore-mentioned, which has also given great satisfaction. There are, of course, cheaper steels on the market, but on the whole they are not cheap in the long run, many failing in the smithing process, causing wasters and loss of workmanship, apart from the trouble caused to the ultimate user in the mill from the reasons referred to earlier, namely minute surface imperfections in the steel.

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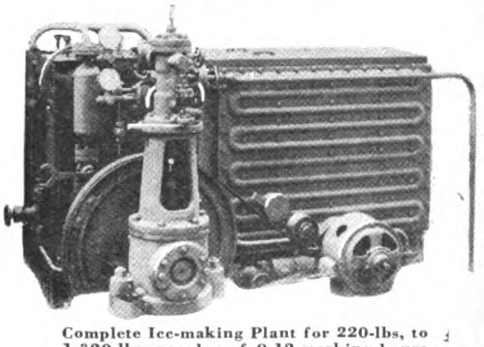

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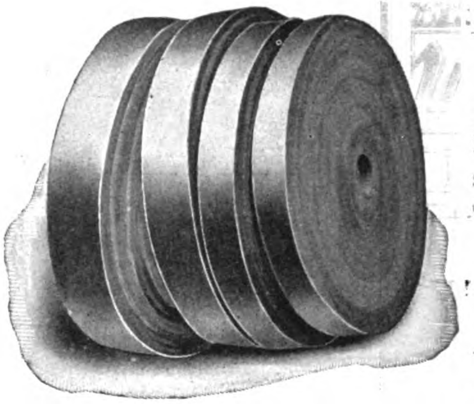

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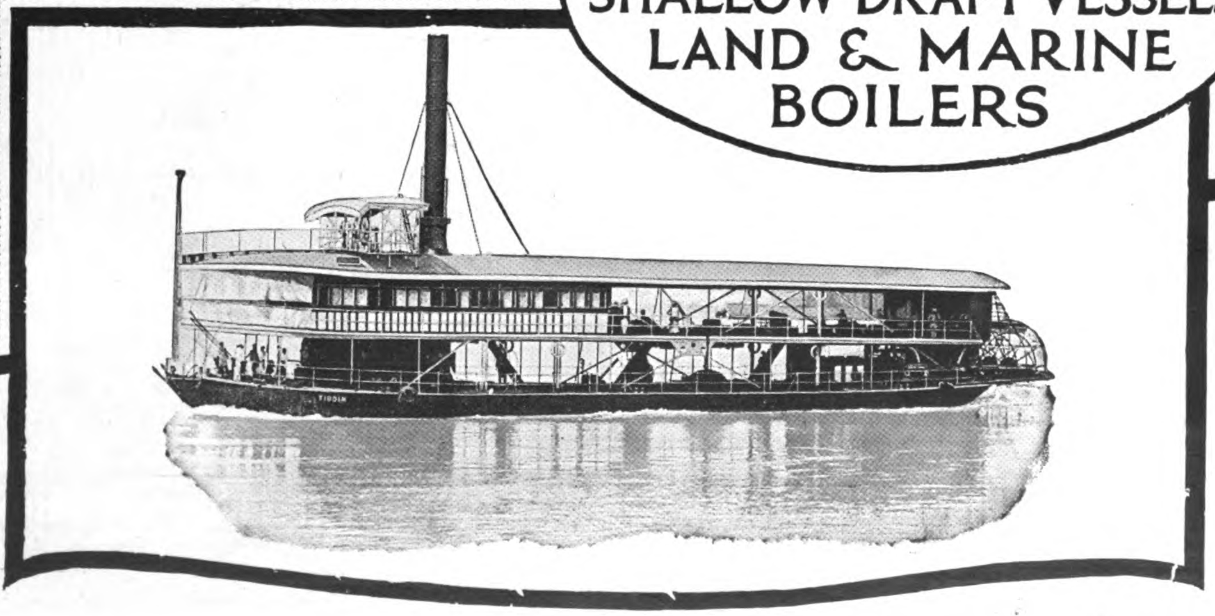

The Far Eastern Rev

ENGINEERING FINANCE COMMERCE

Vol. XX SHANGHAI, FEBRUARY, 1924 No. 2

Feigning Ignorance

The Futility of Concealing the Truth

Reflections on Reading a Book entitled "China: Yesterday and To-day," by Edward Thomas Williams, published by the Thomas Y. Crowell Company of New York

By Geo. Bronson Rea

IN a statement recently issued by the national security league, Rear-Admiral William S. Sims, retired, says that thousands of men have been sacrificed needlessly in every one of the wars waged by the United States, including the world war. After reviewing the unbroken record of governmental inefficiency as clearly proven by official documents, he lays the blame on the "hurrah histories" and Fourth of July orations which make no reference to the ghastly sacrifices caused by continued unpreparedness. These histories are written solely to please the public, to glorify incompetent administrations and—to make money. In order to avoid future wars the people of America should be informed of the whole truth surrounding our costly errors, concludes the admiral, and to this we add that it is just as important that the full truth be made known concerning errors of diplomacy which may precipitate future wars with their inevitable sacrifices.

This preamble leads to a review of a new book, entitled "China: Yesterday and To-day" by Professor E. T. Williams and published by The Thomas Y. Crowell Company of New York. Professor Williams is one of the foremost experts on China. In addition to having filled the important posts of American *chargé de affairs* at Peking, chief of the division of Far Eastern affairs in the state department and Far Eastern expert to the American delegation at the Paris Peace Conference, Professor Williams lived for twenty-six years in China, speaks the language fluently, thinks the thoughts of the people and is thoroughly Chinafied in his viewpoints on the problems confronting the country of which he writes. Professor Williams knows his China inside and out, from back to front cover of the ancient books which reveal her long and wonderful history and the various chapters of his own contribution to the store of knowledge concerning the country are replete with invaluable information. In fact, we unqualifiedly place his book in the fore-front of the many volumes which adorn our library shelves, one of the very few deserving of a permanent place as a work of reference on general subjects. The city, the village, social relations, the craftsmen, guilds, religions, ancient history and politics of the country are written in a style interesting and instructive even to old China hands familiar with the customs of the country.

We are reluctant to criticize an author who in addition to holding our highest personal regard has concentrated in one most instrúctive volume the labors of a lifetime. Professor Williams, the sinologue, is beyond our criticism but Chief Far Eastern Expert Williams of the Wilson administration who very quietly but very effectively moulded and guided our China policy for several years is a different personage.

Expert Williams was present at the Paris and Washington conferences and is familiar with all Far Eastern political documents submitted for the information of the delegates. He knew, or at least should have known, that Sazanoff unofficially filed at Paris on behalf of the old Russian government a copy of the secret alliance entered into between Russia and China in 1896: as an expert he assuredly must have carefully read and stored away in his memory the facts surrounding the signing of this treaty as disclosed in the "Memoirs of Count Witte"; he must have recalled that Witte described how the original Chinese copy of this treaty was found by the Russians in 1900 locked in the private safe of the empress-dowager and how it was subsequently returned by the Russian government to the Chinese authorities; he knew that the Chinese delegation at the request of Secretary Hughes officially filed at the Washington conference a summary of the text of this treaty: yet in his book he studiously ignores the existence of this epoch-making document.

In simulating ignorance of this alliance, Professor Williams is like every other author who adheres to the worn-out theories surrounding the creation of the spheres of influence. Like all other experts gathered together at the Washington conference he was looking out the window when Dr. Koo read the telegraphic summary of this remarkable agreement. Acknowledgement of its importance would have at once clarified the atmosphere and justified Japan in every move she has made in Manchuria since her war with Russia. It would have taken the bottom out of American diplomacy by revealing that at the very time when John Hay was promulgating the "open door" policy with its corollary principle of recognizing the integrity and sovereignty of China, the government of that country had secretly entered into an alliance which handed over its territories to Russia in order that the latter might be in a better position to attack Japan.

The "open door" doctrine was founded on the basic justice of a great principle and its acceptance by the powers carried with it the recognition of the territorial integrity and administrative independence of China within its then recognized boundaries. That doctrine has since become firmly established as a cardinal feature of American foreign policy, yet we do not hesitate to say that had John Hay known of the existence of the secret Li-Lobanoff treaty of alliance he would never have promulgated a principle which on its face could not be carried into practice because of the alienation of territory by the beneficiary of the doctrine for the purpose of prosecuting a war against Japan. He would have been the first to understand that the promulgation at that time of the "open door" and its corollary principle strengthened Russia's power for aggression while seriously impairing Japan's right to defend herself. The application of the doctrine when Russia was openly manœuvring within the territory of her ally to obtain the strategical advantage in the war designed to crush Japan, effectively closed the door to any move on the part of the victim to defend herself. Japan's hands were tied while her enemies were protected in their plans to destroy her. There is no other honest deduction from the facts of history as subsequently revealed to a wondering world. The success of the doctrine which preserved equal opportunities in China for foreign trade was made possible through Japan's sacrifice, and when to this is added, that Russia had firmly determined to annex Manchuria and convert it into a closed preserve and that Japan's victory restored China's full sovereignty over the territory, the statement that the world is indebted to Japan, challenges refutation. Had even an inkling of the existence of such an understanding been suspected by any of John Hay's successors in the state department it is equally safe to assert

that their sense of propriety and justice would never have permitted them to countenance the series of pin pricks against Japan which has characterized American diplomacy in Manchuria since the day when Harriman with his immense political power labored with might and main to deprive Japan of the enjoyment of the modest fruits of victory that fell to her share at Portsmouth. It is inconceivable that American sense of right and justice would have so countenanced the persecution of a valiant nation and blocked her at every step had these facts been known, and it is equally inconceivable that now when the truth has been revealed through China's own confession that Americans reject the evidence and persist in withholding from Japan the justice that is undeniably hers. Had such a trick been perpetrated upon America or any European country there would have been no peace in the world until satisfaction and national honor had been appeased by a suitable indemnity. The "open door" doctrine while it became a cardinal feature of American diplomacy was never endorsed by China, and the existence of this secret treaty (known to every official of the old Tsung Li-Yamên) explains the reason why. From the viewpoint of the old Manchu officials the Hay doctrine was an intolerable intervention in the sovereign affairs of China, and so well did they preserve their secret that Russia fought her war with Japan and China escaped the penalty attached to her participation in bringing it about.

Lest we forget, let us once more glance at the abridged terms of this tieaty:

"Article 1.—The high contracting parties engage to support each other reciprocally by all their land and sea forces in case of any aggression directed by Japan against Russian territory in Eastern Asia, China and Korea.

"Article 2.—No treaty of peace with an adverse party can be concluded by either of them without the consent of the other.

"Article 3.—During military operations all Chinese ports shall be open to Russian vessels.

"Article 4.—The Chinese government consents to the construction of a railway across the province of Amur and Kirin in the direction of Vladivostock. The construction and exploitation of this railway shall be accorded to the Russo-Chinese Bank. The contract shall be concluded between the Chinese minister at St. Petersburg and the Russo-Chinese Bank.

"Article 5.—In time of war Russia shall have free use of the railway for the transport and provisioning of her troops. In time of peace Russia shall have the same right for the transit of her troops and provisions.

"Article 6.—The present treaty shall come into force from the day on which the contract stipulated in Article 4 shall have been confirmed. It shall have force for fifteen years."

The treaty was signed in 1896 and was to run for fifteen years, terminating in 1911. There is no record of its denouncement, so it was in full force at the time of the Russo-Japanese war. China was a full though silent partner with Russia during the struggle of 1904-05.

Any discussion of the terms of this treaty at Washington would have reacted upon the dignity of the very conference before which it was read. The secret Sino-Russian pact made the Anglo-Japanese alliance absolutely imperative but this truth was not permitted to raise its head in a conference convened for the special object of making impossible the extension of this alliance for another period of years. The American people were not permitted to learn a truth which would have told them that the diplomacy of their state department for the past twenty-five years had been based on a fiction. The Chinese submitted the document and it passed into the graveyard of forgotten things. Only one observer had the courage to mention the fact and then wrote a book in which that fact was carefully excluded from any of his conclusions. Americans, British and Chinese joined in a conspiracy of silence to keep the truth from becoming history and inviting attention to their diplomatic shortcomings. The British might easily have defended their whole policy in China since 1898 by citing this alliance as a reason for the pact with Japan and their determination to prevent Russia from carrying out her plan to reach India by way of Chinese territory. The Chinese dared not comment on a treaty which placed them on the defensive and the Japanese were so glad to get through the conference without further disputes that they also remained silent when the truth which justified them before the world was revealed. Everybody present was admiring the scenery along the Potomac when the evidence was presented which made them all look ridiculous.

The experts gathered together in the great conference room heard, but their minds refused to function when it came to a vital piece of evidence which exonerated Japan from the piled up charges of years. No one had the courage to admit his mistakes ; no one dared go before the people of America and confess that after twenty-five years of fulsome slobbering over China, that the old Manchu government had duped the whole world. Not one of these distinguished experts and writers had the moral courage to say a word in favor of Japan who all these years has been subjected to a merciless propaganda based on a perversion of history which placed her in the rôle of a bully and aggressor. Aside from the mere acknowledgement of the filing of the text of the secret treaty of alliance between China and Russia recorded in the official report of the Washington conference for the limitation of armaments, and the one reference to it in the book of Putnam Weale, no newspaper, in Europe, America or China has commented upon or drawn deductions from the evidence so presented.

We could excuse the ordinary writer on Far Eastern matters for ignoring the existence of this document but it is difficult to understand why the Far Eastern expert to the American government rejected this evidence which stands as the basis of modern history in this part of the world. This attack of amnesia on the part of the author makes the chapters of his book devoted to international politics absolutely worthless to the student of these complicated problems.

We stress this point not so much to criticize the otherwise highly meritorious work of Professor Williams but to emphasize the statement that until Far Eastern political history is rewritten in the light of the evidence disclosed by the publication of the text of the secret Sino-Russian treaty of alliance of 1896, a great injustice is being done to Japan, an injustice that if not rectified may still lead to unpleasant happenings. A greater injustice is being perpetrated upon the American people by a conspiracy of silence which preserves the fiction that Japan is the one nation with aggressive designs upon China and in consequence America may be called upon some day in the future to fight Japan in defense of the "open door" principle and the integrity of that country.

It was only a few weeks before the earthquake of September last that two American admirals publicly advocated the appropriation of $150,000,000 for naval bases in the Pacific in order to be prepared against just such an emergency. It is safe to say, however, that even these two highly placed strategists were ignorant of the existence of an alliance which forced Japan into a cruel and disastrous war to maintain her independence and that by reason of the profound secrecy surrounding the treaty, was buncoed out of the legitimate fruits of victory at Portsmouth. Had Japan known of the existence of that treaty in 1905, there would have been no further discussions over the sovereignty of Manchuria or the Kwantung Leased Territory. It is time Americans should face the truth. Justice, however tardy, should be rendered to Japan even though it involves a complete rewriting of history, remodelling of foreign policies and the frank admission of diplomatic errors.

The day may possibly arise when Americans will be called upon to face these facts over the raising of some question concerning Japan's position or rights in Kwantung or Manchuria and a rush will then be made to the libraries to read up the old books on the controversy.

All these books are based on a false hypothesis, utterly worthless and out of date. Unless the American people are made acquainted with the real origins of the dispute we may once more witness the spectacle of a sentimental people being imposed upon by the propaganda of "experts," who, as President Wilson said of Mr. Hughes, the premier of Australia, "can't hear and won't read." Or, as the Spaniard would say, "no se dan por entendidos."

2. What Is China?

In the Light of China's Own Confession, is Japan Entitled to Reparations?

IN the opening chapter of his book, Professor Williams propounds the conumdrum which staggered even the galaxy of experts gathered together at the Washington conference—What is China? Any attempt to answer the question would have provoked a controversy, says Professor Williams, and we may add that any attempt to force a decision as to what actually constitutes China would precipitate a crisis and the convoking of another conference to settle the argument without recourse to arms. With all his accumulated store of expert and inside knowledge derived from years of access to diplomatic records, Professor Williams like a wise man, side steps the answer. He says:

"The nine-power treaty, signed at that Conference, in its first article stipulates that the powers other than China shall respect the sovereignty, the independence and the territorial and administrative integrity of China. But what does that mean?

Territorial Boundaries

"Does it, for instance, require the eight powers concerned to respect China's claim to sovereignty in Tibet? Does it mean that these powers recognize Tibet as an integral part of China? The question is important, for, although Tibet has belonged to China for many centuries, during recent years both Russia and Great Britain have manœuvred for position to control the future of this forbidding land, which a British writer describes as 'rich in gold. . . enormously rich, possibly richer than any other country in the world.'

Tibet

"In 1912 the British government objected to the provision of the Chinese constitution which gives Tibet representatives in the parliament at Peking. Objection was made also by the power to China's proposal to send a small military force to Lhasa to protect the Chinese president there. Warning was given that, should troops be sent as proposed, Great Britain would withhold from the new republic of China the recognition which it was then asking.

"In 1913, at the request of Great Britain, a conference was held at Simla to consider the relations of the three countries—Great Britain, China and Tibet.

"The British delegation drew up a treaty which proposed to divide Tibet into two parts—outer Tibet, adjoining India, and inner Tibet, bordering on China. The former was to be autonomous under a shadowy suzerainty of China, and it was further provided that in case of difficulties arising between autonomous Tibet and China, the questions at issue should be referred to Great Britain for equitable adjustment. This proposed treaty would thus have put Great Britain in the position of protector of Tibet. It is interesting to recall that it was by similar arrangements that the British government came gradually into control of Northern India. Sikkim, Nepaul and Bhutan, once tributaries of China, are now under British control. In 1912, however, China refused to sign the proposed treaty; Tibet was willing to accept it. The question therefore remains unsettled: Is China sovereign in Tibet?

Outer Mongolia

"In 1911 Russia encouraged outer Mongolia to declare its independence of China, although it had been a part of the empire since A.D. 1691. Under this encouragement advantage was taken of the revolution in progress in China to establish an independent Mongol government under the rulership of the Hutukhtu of Urga, who was elected emperor and crowned in December, 1911.

"Subsequently by a tripartite convention signed in 1915, the suzerainty of China and the autonomy of outer Mongolia were acknowledged, and Russia was given a voice in the settlement of questions affecting the foreign relations of the country.

"After the disappearance of the tsarist régime in Russia, China reasserted her authority and compelled the Hutukhtu, in 1919, to rescind his declaration of autonomy. He yielded only under pressure of the military occupation of his capital. When Urga was attacked and captured in February 1921 by a Russian force commanded by Ungern von Sterberg, a reactionary leader, the Mongols gave him support. Japan, which was believed to be anxious to see a conservative buffer state between Korea and Siberia, was also popularly credited with giving assistance to Ungern, and was reported to have offered a loan to the Hutukhtu, if a non-communistic government should be maintained by him.

"After a few weeks, however, Ungern was overthrown by the army of the Far Eastern republic, and Urga was turned over to the troops of the Russian federated soviet republic, which set up there the peoples' revolutionary government. This government still holds the place.

"What then is the status of outer Mongolia? What is its relation to China? Does the nine-power treaty bind the signatories to respect China's sovereignty and administrative integrity in outer Mongolia?

Manchuria

"When the war between Russia and Japan came to an end in 1905, the treaty of Portsmouth stipulated that both powers were to evacuate Manchuria completely and simultaneously, except the leased territory of Liaotung. The two powers were also to restore entirely and completely to the exclusive administration of China all portions of Manchuria then in occupation or control of Japanese or Russian troops, except the leased territory just mentioned. The two powers also engaged to exploit their respective railways in Manchuria exclusively for commercial and industrial purposes. Again in the treaty of July 30, 1907, these same governments recognized the independence and territorial integrity of the empire of China and the principle of equal opportunity there for the commerce and industry of all nations.

"Yet in the secret treaties of 1907, 1910 and 1912 they delimited their respective spheres of special interest in Manchuria and Mongolia, and each agreed not to interfere in the consolidation and future development of the special interests of the other in the spheres mentioned.

"Furthermore in 1915, by the treaties of May 25, Japan after landing troops and issuing an ultimatum, obtained special privileges in south Manchuria and eastern inner Mongolia.

"At the recent Washington conference Japan withdrew certain of the twenty-one demands of 1915 which had been reserved for further consideration, and agreed that the option which had been obtained on loans for railway building in eastern inner Mongolia and south Manchuria, and on other loans secured upon taxes in the regions mentioned should be 'thrown open to the joint activity of the international consortium recently organized.' She also surrendered the preference obtained in the appointment of advisers to the Chinese government in south Manchuria. But Japan refused to rescind the whole of the twenty-one demands as requested by China, Baron Shidehara said:

"If it should once be recognized that rights solemnly granted by treaty may be revoked at any time on the ground that they were conceded against the spontaneous wi.l of the grantor, an exceedingly dangerous precedent will be established, with far-reaching consequences upon the stability of the existing international relations in Asia, in Europe and everywhere.

"To this Mr. Wang Chang-hui replied that—

"A still more dangerous precedent will be established, with consequences upon the stability of international relations which cannot be estimated, if without rebuke or protest from the powers, one nation can obtain from a friendly, but in a military sense weaker neighbor, and under circumstances such as attended the negotiations and signing of the treaties of 1915, valuable concessions which were not in satisfaction of pending controversies, and for which no *quid pro quo* was offered.

"It was through the twenty-one demands of 1915 that Japan compelled China against her will to cancell her right to redeem the south Manchuria Railway in 1939, as provided in the original contract. It was by means of the treaties of May 25, 1915, extorted from China in connection with the twenty-one demands, that Japan was enabled to extend her lease of the Liaotung peninsula from 25 years to 99 years. The twenty-five-year period would have terminated in 1923. By means of these same treaties the leases of the South Manchurian and Mukden-Antung Railways were also extended to 99-year periods.

"In view of all these facts what is to be said of the status of Manchuria? With large bodies of Japanese troops stationed in various parts of Manchuria, and with Japanese police forces in the Chientao district and elsewhere, to what extent does the nine-power treaty guarantee Chinese administrative integrity in Manchuria?

"The future will answer the question raised. For the present we can accept no other boundaries for China than those existing under the Manchu Government at the time of its overthrow in 1912, and we must continue to regard Tibet, Mongolia, and Manchuria, therefore, as wholly within the territory of the Chinese republic."

The future, says Professor Williams, will answer the question, by which we infer that when the time arrives the Chinese themselves will compel acceptance to their meaning of what constitutes China. It is a remarkable coincidence, however, that whenever this question is raised it is invariably propounded by an American and directed exclusively at Japan's position in Manchuria or the Kwantung leased territory. Never by any mistake is Great Britain's position in Tibet or Russia's rape of Mongolia questioned; never are French activities in Yunnan made the subject of inquiry; the propaganda is concentrated solely upon Japan, the one nation who paid and paid dearly for every advantage she holds in a province watered by the blood of 200,000 heroes who gave their lives that their homeland might remain independent.

We have quoted Professor Williams in full in order to illustrate how skilfully he omitted any reference to the origins of the war between Russia and Japan. He starts at the middle of the story, at the treaty of Portsmouth and bases his conclusions on this and subsequent negotiations. He quotes freely from all other secret

documents; he quotes Baron Shidehara and Dr. Wang Chung-hui's rejoinder, supplementing these with his own remarks, but never once does he refer to the evidence which would have compelled a departure from his thinly veiled anti-Japanese line of argument.

There are no statutes of limitation invalidating international wrong-doing. By her own confession China is exposed to any demands Japan may present in the future for the payment of an indemnity for her part in the war of 1905. Because Japan has not done so does not mean that she has waived her right to reopen the issue at an opportune moment. It does not mean that China will be permitted to escape scot-free for her treachery. A very dangerous precedent would be established if without rebuke or protest from the powers, one nation can secretly conspire with another to wage war upon a neighbor under circumstances such as surrounded the signing of the Li-Lobanoff secret treaty of alliance in 1896 and which precipitated the bloodiest war in history to that date, and escape all censure and the consequences of its double-dealing even when in after years it frankly confesses its responsibility and complicity. To admit that China is not responsible for acts committed twenty-five years ago is to repudiate all laws of equity and judicial procedure. The force of China's confession at Washington simply staggered those who understood its full import and they dared not comment upon it without disclosing that the chancellories of all the powers had based their diplomacy for the past quarter century on a false premise. Before this great crime which reddened the soil of Manchuria with the best blood of Japan and brought the empire to the verge of bankruptcy the paltry treaties extracted by Japan from China under the ultimatum of 1915 pale into insignificance.

Japan extracted from China in 1915 a very small portion of what she would have been entitled to ten years previous had the truth then been known. Not only the Kwantung leased territory but the whole of north and south Manchuria would have passed under Japanese sovereignty as the legitimate spoils of war had the truth revealed at Washington been even suspected at Portsmouth.

It is essential to iterate and reiterate this truth in order to counteract the growing tendency on the part of Chinese and their American sympathizers to keep alive the agitation over Japan's position in Manchuria. Americans may feign ignorance of the facts in order to ingratiate themselves with the Chinese. China may some day again question the validity of the 1915 treaties, but whenever the question is seriously raised, whether directly by China or indirectly by America, they must be prepared to face China's confession of guilt and Japan's counter demand for an indemnity that will cause the world to gasp. If such a time ever arrives, the demand will be backed by the full weight of Japan's military forces and endorsed by every man in the empire capable of carrying a rifle. Japan went to the Washington conference only after being assured that the question of her rights in Manchuria were not to be made a subject for discussion. Whatever she surrendered, she did voluntarily, without pressure. She will consent to no further impairment of her dearly bought position.

For America to again question the validity of Japan's status in Manchuria or the Kwantung leased territory after the full and frank understandings arrived at during the Washington conference, would lead Japan to suspect that Americans are determined to create a situation which will ultimately undermine her rights in these regions. How far these rights can be impaired or whittled away is merely a question of how far Japan will further recede without a fight. We reject the idea that the present administration would in any way provoke such a controversy yet even as we write this article a subordinate branch of our foreign service has reversed the established policy of the state department in recognizing Japan's sovereign powers in the Kwantung leased territory, and, if upheld, the decision will compel a revision of the treaties and a readjustment of our diplomatic intercourse with Japan.

3. Back to Portsmouth

The U.S. Court for China Prepares the Way for a Revision of the Treaties

THE issue referred to the preceding article is involved in a case in which an American sea captain is charged with having assaulted four members of his crew while under the influence of drink on shore at the port of Dairen, located in the Kwantung leased territory. The seaman complained to the acting American consul at that port who instructed them to lay their case before the U. S. district attorney at Shanghai. This rather unusual procedure, we are informed, arose from the acting consul's desire to avoid trouble and the delay to the vessel involved in bringing the case before the Japanese police courts. Upon the arrival of the steamship at Shanghai the four seamen placed their complaint before the American consul-general but as the alleged assault took place outside the limits of the Shanghai consular district he very properly disclaimed jurisdiction over the case. The four men then called upon the U. S. district attorney and a warrant was sworn out which cited the captain to appear before the U. S. court for China. The captain's lawyer contended that inasmuch as the alleged assault had occurred in Dairen and under the sovereign power of Japan, the U. S. court for China had no jusrisdiction. This objection was overruled. The decision squarely raises the question of Japan's juridical rights in the Kwantung leased territory, and, if upheld, must result in a loss of face for the state department which ever since Japan has been in possession of the territory has recognized her jurisdiction over foreigners residing there, accrediting the consul at the port of Dairen to the Japanese government under the embassy at Tokyo and in all other ways acknowledgeing Japan's sovereign powers. After a lapse of nineteen years the United States court for China now says that the state department is wrong; that it had no right to surrender the extraterritorial rights conceded by China to American citizens in the original treaty of 1844 without being authorized to do so by an act of congress and proceeds to interpret the treaties in support of this decision.

The Decision

The ruling on the question handed down by the court and given out for publication, says

"The defendant in this cause questions the jurisdiction of the United States court for China to act on the ground that the crime herein charged was committed in the city of Dairen, which is situtated in that portion of China known as the Liaotung peninsula and known as the leased territory, claiming it to be under the sovereign power of Japan.

"In determining the questions herein involved, it is deemed necessary to construe the various treaties entered into by the United States with China, as they are the governing law.

"In the year 1844, the United States entered into a treaty with China which gave to the former certain extraterritorial rights within the territory of the latter. In article No. 21 of said treaty, the United States was given jurisdiction to try and punish its citizens who were charged with the commission of a crime within the territorial limits of China, and it reads as follows:

'Subjects of China who may be guilty of any criminal acts towards any citizens of the United States, shall be arrested and punished by the Chinese authorities according to the laws of China, and citizens of the United States who may commit any crimes in China shall be subject to be tried and punished only by the consul or other public functionary of the United States. And in further prevention of all controversy and disaffection, justice shall be equally and impartially administered on both sides.'

"The same jurisdiction was also embodied in the treaty of 1858 in article No. 11 thereof.

"On March 27, 1898, the Russian government concluded a lease with China regarding the Liaotung peninsula. In article No. 1 of the terms of this lease, and in the last paragraph of said article, it reads as follows"

'This act of lease, however, in no way violates the sovereign rights of his majesty the emperor of China to the above mentioned territory:'

The territory described in this lease included the city of Dalny which has since been renamed Dairen.

"In the treaty of peace between Russia and Japan, dated September 5, 1905, Russia transferred the lease she had made with China relative to the Liaotung peninsula to Japan, but subject, however, to the consent of China who ratified it on January 23, 1906, under a separate treaty with Japan.

An Analysis

" In analysing the intentions of the parties to these treaties, it appears that China in the original lease made with Russia reserved to herself her sovereign powers over this territory as it was explicitly so stated in the body of the lease. It further appears that in the treaty of peace between Russia and Japan, these same rights were transferred to the latter subject, however, to the acquiescence of China which appears to have been given a few months later. The period of this lease as acquired by Japan extended only until March 27, 1923. In the beginning of the year 1915, Japan sought to renew the Liaotung lease with China, and exchanged notes respecting same under the title of The Treaty Respecting South Manchuria and Eastern Inner Mongolia. This treaty among other things extended the term of the lease of Port Arthur and Dalny for a period of ninety-nine years. It also contained an article which can be said bears strongly on the question that is being considered here.

This article known as article No. 5 of said treaty in ths second paragraph thereof, reads as follows :

' Civil and criminal cases in with the defendants are Japanese, shall be tried and adjudicated by the Japanese consul ; those in which the defendants are Chinese, shall be tried and adjudicated by Chinese authorities. In either case, an officer may be deputed to the court to attend the proceedings ; but amongst civil cases between Chinese and Japanese relating to land, shall be tried and adjudicated by delegates of both nations conjointly in accordance with Chinese laws and local usage.'

" In construing this particular part of the treaty, it shows conclusively that Japan recognized the sovereignty of China, and reiterated in specific terms her extraterritorial rights for her subjects and does not claim supreme powers to herself to the exclusion of Chinese sovereignty in this particular territory.

" During the negotiations between Japan and China respecting this treaty, the famous twenty-one demands presented to China by Japan came into existence, one of which, bore directly on the extension of the lease of Port Arthur and Dalny. On May 8, 1915, an ultimatum was handed to China by Japan requiring her to agree to these demands which the former claims was accepted under duress. However, before China's formal acceptance was given, the United States government communicated the reservation of rights of the American government under date of May 13, 1915, as follows :

' In view of the circumstances of the negotiations which have taken place, and which are now pending between the government of China and the government of Japan, and of the agreements which have been reached as a result thereof, the government of the United States has the honor to notify the government of the Chinese republic that it cannot recognize any agreement or undertaking which has been entered into or may be entered into between the governments of China and Japan impairing the treaty rights of the United States and its citizens in China ; the political or territorial integrity of the republic of China or the international policy relative to China, commonly known as the ' open door ' policy.'

" It is here very apparent that the United States has not been a party to or has in any way waived her extraterritorial rights given to her by the various treaties with China, and took the occasion to so notify both China and Japan before this treaty was actually signed.

At Washington

" The same question subsequently occupied a very important part in the sixth plenary session of the conference on the limitation of armaments held in Washington on February 4, 1922 (page 324).

" The chairman, the Honorable Charles Evans Hughes, secretary of state of the United States, read into the record of that session the following statements which were declared to be a part of the record, and agreed to by the representative of the powers present. It reads in part as follows :

' By the chairman :

' I am directed by the committee on Pacific and Far Eastern questions to read for the purpose of having the statements formally placed upon the records of the conference, the following declarations with respect to the so-called twenty-one demands of the Sino-Japanese treaties of 1915.

' The first statement that I shall read is the statement made to the committee by Baron Shidehara on behalf of the Japanese government . . .

' (2) Japan has no intention of insisting on her preferential rights in the Sino-Japanese arrangement in question concerning the engagement in China of Japanese advisors or instructors on political, financial, military or police matters in South Manchuria.'

" And in article No. 3 of the last text is found :

' In coming to this decision which I have had the honor to announce, Japan has been guided by a spirit of fairness and moderation, having always in view China's sovereign rights and the principle of equal opportunity.'

" The chairman, then on behalf of the government of the United States, read in part as follows :

' With respect to this grant, the government of the United States will, of course, regard it as not intended to be exclusive, and, as in the past, will claim from the Chinese government for American citizens, the benefits accruing to them by virtue of the most favored nation clause in the treaties between the United States and China.'

"In these utterances which have been made a permanent record, and adopted by the United States government, it shows conclusively that it never has relinquished its extraterritorial rights in this particular territory in question.

" It further appears that Mr. Hay, secretary of state in 1900, instructed the consuls in China that they had no authority to exercise extraterritorial jurisdiction or to perform non-judicial consular acts within the leased territory under their present Chinese exequators, and that his instructions were complied with : that the reason for so acting was due to the fact that the other powers with the exception of Japan were under the opinion at that time that the leasing of Weihaiwei, Shantung and the Liaotung peninsula transferred the sovereignty to the lessees.

" In the memorandum of Mr. Van Dyne assistant solicitor for the United States (For Rel. 1900, 387, 388, 389, Moore's International Law Digest) he seems to take a different view of this situation that did Mr. Hay, and says :

' As it is expressly stipulated in the lease that China retains sovereignty over the territory leased, it could doubtless be asserted that such territory is still Chinese territory and that the provisions of our treaties with China granting consu.ar jurisdiction are still applicable therein. But in view of the express relinquishment of jurisdiction by China, I infer that the territory is permanently(?) is merely intended to cut off possible future claims of the lessees that the sovereignty of the territory is permanently vested in them. The intention and effects of these leases appear to me to have been the relinquishment by China, during the term of the leases, and the conferring upon the foreign power in each case of all jurisdiction over the territory. Such relinquishment would seem, also, to involve the loss by the United States of its right to exercise consular jurisdiction in the territories leased. And, as Mr. Conger suggests, as these territories have practically passed from the control of an uncivilized people to civilized, there would seem to be no substantial reason for continuing to exercise such jurisdication.'

" Furthermore, the United States was given certain rights within the integral territory of China by a treaty, and these rights can be abrogated in no other way than that in which they were given, In other words, before the United States relinquished extraterritoriality in any portion of China as existed in 1844, there must be definite action taken by congress.

" Judge Moore in his International Law Digest (Vol. 5, page 321) says :

' That the contracting power can annul the treaty cannot, I presume, be questioned, the same authority precisely, being exercised in annulling as in making a treaty.'

" He further ennunciates a principle (Voi. 5, page 337) which strongly bears on this case, and which reads as follows :

' An alliance between two nations cannot absolve either of them from the obligations of previous treaties with third powers.'

" And again (Vol. 5, page 369):

' It is the duty of the courts not to construe an act of congress as modifying and annulling a treaty made with another nation, unless its words clearly and strongly point to such a construction.'

Citing in support of this, principly, the cases of Lem Moon Sing vs. U. S. 158 U. S. 538, and U. S. vs. Mrs. Gue Lin, 176 U. S. 459.

" This last principle of Judge Moore's seems to cover the situation herein involved. The defendant in this case is the one that is attacking the jurisdiction of the United States in exercising its authority over him in an action brought in its federal court. There is no positive assertion on the part of the United States that it has abrogated its treaties with China in respect to the issue involved in this case.

" It might be said that this situation would become more complex should this same objection be made by a friendly power, as the disposition of the matter would then be adjudicated by a totally different tribunal.

" Having taken into consideration the various phases of this novel case, I fail to find that the United States Court for China has lost its jurisdiction over this defendant who is charged with committing a crime within the leased territory of China, and more particularly described as being in the city of Dairen. The defendant's demurrer is therefore, accordingly overruled, and as there appears to be sufficient evidence adduced to make out a *prima facie* case of assault against him, he is required to answer the information filed herein."

Commissioner Lurton has rendered a most interesting decision based on his interpretation of the treaties, and as it is a purely legal one will have to be passed upon by a higher judicial authority before it can be lightly set aside. However, strong it may be from a legal viewpoint, it seems to us altogether unnecessary. As he points out, the American government at the time of of the twenty-one demands sent an identic note to the governments of China and Japan in which it reserved the rights of American citizens under the prevailing treaties in any new agreement which might be entered into as a result of the negotiations then in progress. That was a very definite statement and seemed to compromise our government to take equally definite steps in upholding it. On the other hand, Baron Shidehara speaking for Japan at the Washington conference, just as firmly announced the position of his government when he informed the delegates that " if rights solemnly granted by treaty may be revoked at any time on the ground that they were conceded against the spontaneous will of the grantor, an exceedingly dangerous precedent will be established, with far-reaching consequences upon the stability of the existing international relations in Asia, in Europe and everywhere."

When, during the same conference Baron Shidehara on the part of Japan waived all preferential rights acquired as a result of these 1915 treaties, it was distinctly understood that this surrender referred particularly to Manchuria. The one and only reason why Japan refused to cancel the treaty itself was because it contained the clause which extended the Kwantung lease to 99 years, the real heart of the twenty-one demands, readily agreed to by China in the early stages of the negotiations without pressure from Japan. Furthermore, the American government was fully informed previous to the convocation of the Washington conference that Japan would attend only on condition that the validity of her acquired rights in Manchuria and Kwantung were not made part of the discussions.

In the heart-to-heart talk between General Leonard Wood and the military leaders of Japan held in Tokyo a few months before the opening of the Washington conference the cards were laid on the table. There was no bluffing. The irreducible minimum of concessions on both sides was frankly and openly declared. Japan's minimum was the preservation of her acquired rights and position in Manchuria and the Kwantung leased territory. This unofficial exchange of views cleared the way for the brilliant success of the diplomats at Washington. Japan entered the conference willing to make every concession for peace compatible with her dignity and vital interests. She drew the line at Kwantung, and cancellation of the 1915 treaty.

The American note quoted in Commissioner Lurton's decision is therefore offset by Baron Shidehara's equally emphatic statement. For nineteen years the state department has acknowledged Japan's sovereign rights in Kwantung and it will do no good to reopen an issue permitted to die a natural death, as a result of a frank exchange of views by both America and Japan. It is well to let sleeping dogs lie.

If the ruling of the U. S. court for China is correct when it says that rights acquired within the integral territory of China by treaty can be abrogated in no other way than that in which they were given (in other words, before the United States relinquishes extraterritoriality in any portion of China as it existed in 1844 there must be definite action taken by congress) we are headed for another merry old squabble over China. By the same logic and ruling the judge of the U. S. court for China retains jurisdiction over Americans residing in the Kowloon leased territory, notwithstanding China's surrender of jurisdiction in the lease. It is safe to say however, that if an American is arrested, tried and punished by a British court for some infraction of the laws committed in the slice of China leased to Great Britain, the question of American jurisdiction will never be raised, nor can we picture the U. S. court for China holding a hearing over an American charged with committing a crime in this region. It now remains for the Japanese authorities to arrest, try and jail the first American offender against their laws in Dairen in order to precipitate another international brawl. If the ruling holds good, the state department must energetically protest against such interference with the rights of Americans conceded by China in 1844. In all fairness it would have to do the same if the British should so far ignore our just rights and exercise juridical powers over Americans residing in the Kowloon leased territory.

It is just possible, however, that a higher court will overrule Commissioner Lurton's interpretation of the treaties in order to avoid another general row over the meaning of what constitutes China and to preserve the dignity of the state department. If congress should now be asked to take action on all impairments of China's sovereignty and alienation of territory since 1844 what a jolly old international comedy would be staged when the curtain is rung up at Washington by the introduction of the several bills required to fully cover these infringements of American treaty rights.

Let us look at the question from another angle. If the American court retains jurisdiction over its citizens in the Kwantung leased territory, so do all other nations. Now Kwantung is ruled by a Japanese governor-general. It is a military stronghold, the strategic key for the proper defense of Japan against another attack from the north. In this territory, Japan must exercise full juridical rights, or her position from a military viewpoint becomes impossible. In the event of hostilities or military preparations against any contingency, under this ruling Japan would be unable to exercise jurisdiction over spies and enemy agents. On this score alone the ruling prohibits her from exercising powers vital to the maintenance of her position.

Some time long before the expiration of the leases to Kwantung, Kowloon and Kwangchow-wan, foreign extraterritorial rights will be surrendered in China. If the ruling of the U.S. court for China is upheld, all foreigners residing in these leased territories will then automatically come under Chinese jurisdiction, and to carry the decision to its logical end, the establishment of Chinese courts within these territories will follow as a matter of course. Japan will then have no power over foreigners residing in her leasehold who violate her laws or military regulations. What a fine mix-up this will cause.

The decision strengthens our own contention that there are no statue of limitations to international wrong-doing, and when the United States court for China harks back to 1844 to support a decision and asserts that even the state department has been mistaken in its interpretation of the treaties ever since John Hay recognized Japan's sovereign powers in Kwantung, then Japan would be equally justified in harking back to 1896 and demanding a revision of the treaties based on the new evidence disclosed in the confession of China before the international conference at Washington. It's a poor rule that don't work both ways.

Higher authorities may or may not uphold the court, but the decision will stand in the records as the carefully prepared interpretation of the treaties by a legal expert. By appealing to the same line of argument the Japanese government is provided with a precedent justifying it at any time it considers opportune, in asking for a reopening of the whole Manchurian question. The raising of the issue by the U. S. court for China may call for a complete readjustment of Far Eastern political boundaries, and in the light of China's own confession, an end would be brought for all time to the interminable nagging of Japan as to her rights in Manchuria and Kwantung.

Chinese Railway Dreams

NOTWITHSTANDING that up to the organization of the consortium the Chinese government had contracted for the construction of over 12,000 miles of new railways which at prevailing costs will require the floating of loans aggregating over a billion gold dollars, every now and then comes the news of agreements for the building of additional lines. To the above mileage is now added another 2,000 miles for the Canton-Chengtu railway with its branches and the three lines recently contracted for in North China totalling five hundred or more miles and calling for an additional three to four hundred million gold dollars to the billion or more in loans waiting to be floated. There is not enough available money in the world to finance China's legitimate railway contracts, yet still they come, flocking to the Eldorado where fool's gold lures the inexperienced and blinds his eyes to the truth.

The Canton-Chengtu-Yunnan Lines

In April of last year, Dr. Sun Yat-sen, in his capacity as head of the southern confederation of provinces, entered into an agreement with the Northern Construction Company of Vancouver for financing and constructing a railway from Canton to Chengtu in Szechuan with a branch parting from the main system somewhere in Kweichow province and terminating at Yunnanfu. In the event of unification of the government, Dr. Sun compromised on behalf of the southern provinces that the contract would be recognized and taken over by the central authorities. The terms were similar to the agreement signed in 1913 between Dr. Sun and Pauling & Company, Ltd., for the building of the same line and like that contract stands as the most favorable to China yet entered into for railway construction. The contractor agreed to build and equip the line on a basis of five per cent. construction profit or one-third less than Pauling & Company and three-eighths under the Siems-Carey terms. The financial conditions were left open in the preliminary agreement in order to enable the contractor to sound the financial markets in Canada, America and England. He was allowed six months to do this with a further six months in the event satisfactory progress could be shown. Another six months extension was provided for in case conditions warranted it, but it was understood that unless the contractor could raise

the loans on satisfactory terms within twelve months, the agreement would be null and void. The bonds on the first two sections of the line traversing Kwangtung and Kwangsi were to be guaranteed by the governments of these two provinces and secured on the provincial revenues pending national unification, when they were to be additionally secured on the general revenues and good faith of the central government of China. On the whole, the contract was conditional on the ability of the contractor to furnish the loans on terms acceptable to Dr. Sun and does not compromise the Chinese people to any surrender of a valuable right. Its one outstanding feature is the extremely low construction profits. These will stand not only as a further proof of Dr. Sun's honesty and ability but as in the case of the Pauling contract of 1913 serve as a guide for future contracts of a similar nature. Owing to the existence of the consortium agreement the contract may never be carried out, but Dr. Sun took a chance with the largest railway constructors of Canada and in so doing created terms which others will have to meet in any open or fair competition for the construction of future railways in this country. Owing to the absence of definite surveys it was obviously impossible to estimate the exact cost of the proposed lines or formulate an approximate idea of the extent of the loans necessary. Each section was to be surveyed, the costs estimated, the loans calculated upon these figures and the details of each installment to be agreed upon before being placed on the market. Viewed as a percentage contract it is above criticism and whatever may be the objections to Dr. Sun in a political sense he once again demonstrated that China can obtain exceptionally favorable terms in open and honorable dealing with foreign constructors.

The line and its branches as proposed by Dr. Sun is most vital for the proper economic development of China, linking together the provinces of Kwangtung, Kwangsi, Kueichow, Yunnan and Szechuan and providing a deep water port within Chinese jurisdiction as an outlet for the trade and products of this vast region. If a deep water port is ever created at Canton, the construction of this railway and the completion of the Canton-Hankow line will draw all the traffic of south and southwestern China to its legitimate outlet. Politically, the Canton-Chengtu-Yunnan line will bind together the liberal provinces of the south and enable them to present a solid front against any future attempt on the part of northern militarists or monarchists to overthrow a constitutional government. It was for this reason that Yuan Shih-kai vetoed the original contract for this line between Dr. Sun and Pauling which he contended would develop Canton into a large commercial centre with huge revenues for the Kuomintang party which would enable the parliamentarians to block his plans to revive the monarchy. For this reason he insisted in the final agreement, that the line be changed to one beginning at Shasi on the Yangtze and terminating in Singyfu in southwestern Kweichow, there to connect with the French Yamchow-Yunnanfu line. The political and economic value of the Canton-Chengtu line and its branches are so great that in any compromise between the warring factions resulting in a unified government, Dr. Sun Yat-sen and the other chiefs of the southern provinces will enforce as one of their conditions the recognition of this contract in order that the south will be given an even break with the north in the allocation of national revenues as security for future railway construction.

The Hollamby Contracts

In contrast to the contract for the Canton-Chengtu line signed by Dr. Sun are the three agreements alleged to have been entered into by certain Chinese "promotors" in North China with the British firm of Hollamby & Company. Although the identity of the Chinese principals to these contracts is somewhat obscure and the Waichiaopu is reported to have repudiated them, full information even to the details of the preliminary agreement have been printed in the Peking and Tientsin newspapers. The railways said to have been contracted for, are (1) the Chefoo-Weihsien line, at an estimated cost of £4,000,000: (2) Tsangchow to Shikiachwang to cost £5,000,000 and (3) a line from Tientsin to Chihfeng in Eastern Inner Mongolia, to cost £10,000,000, a total of £19,000,000.

The Chefoo-Weihsien Project

It is difficult to believe that any sensible business man would enter into a contract for financing and building the above-mentioned lines and pay in advance a stipulated sum equal to five per cent. of the total loans (in the neighborhood of four and a half million gold dollars) when previous claims are taken into consideration. The projected line from Chefoo to Weihsien has filled more newspaper space than any other one railway proposition in China. Ever since the Germans entered the province of Shantung in 1898 there have been schemes, intrigues and fights between the central and provincial governments on the one hand and between the Chefoo chamber of commerce, the merchants and gentry on the other, over the right to finance and build this railway. It would serve no good purpose to spoil more good newspaper and tire the reader with a resumé of the history of this scheme. The only point that matters is that in the Shantung treaty between Japan and China signed at Washington in February, 1922, Japan surrendered all preferential rights inherited through taking over the rights of Germany in that province, and, further, renounced any claim to have the Chefoo-Weihsien railway included in the consortium pool, *provided the line is to be constructed with Chinese capital.* This would appear to be very clear, so when the Chinese now enter into an agreement with the British firm of Hollamby & Company acting as agents for the Anglo-Chinese Ventures Syndicate, Limited of London, it violates the treaty with Japan signed as one result of the Washington conference. This attempt to keep alive the agitation against Japan would seem to be strengthened by a further study of the facts surrounding the other two projected lines included in the contract.

The Tsangchow-Shikiachwang Line

It may be quite proper to differentitate between a railway crossing the zone between the Peking-Mukden and Tientsin-Pukow lines connecting Tsinanfu and Shuntehfu and a line a little further to the north connecting Tsangchow and Shikiachwang. For all practical purposes they will serve the same region. The construction of one makes the other superfluous. Now the line from Tsinan to Shuntehfu is also one of the concessions inherited by Japan from Germany and subsequently confirmed by the signing of an agreement between Japan and China in September 1918. Japan paid over to the Chinese government the sum of Y.20,000,000 as an advance on the loan for the construction of this and the Kaomi-Hsuchow line. In the Shantung treaty signed at Washington (referred to above) Japan's rights to these two lines were surrendered to the international financial group. China's acceptance of this transfer of rights constitutes on her part an official recognition of the consortium and an obligation to repay the advances on these loans. To destroy the value of the Tsinan-Shuntehfu link, before this obligation is met would seem to be a flagrant breach of the Washington treaties. The purpose of both the Tsinan-Shuntehfu and the Tsangchow-Shikiachwang lines is to link the two north and south trunk railways and while there is a special reason for the latter which provides the Cheng-Tai line with a more direct outlet to Tientsin there can be little doubt that the object of the contract is to raise a political question with Japan or the consortium powers.

The Tientsin-Chihfeng Line

The full extent of the politics surrounding the Hollamby contracts is more clearly seen in the line from Tientsin to Chihfeng in Eastern Inner Mongolia, though here the politics are as much internal as international. The Peking and Tientsin newspapers state that the construction of this line has been strongly urged by General Wu Pei-fu, and if this is the case, it must be accepted as a strategical move, which if carried out, would enable General Wu to outflank General Chang Tso-lin in the final fight between these redoubtable war-lords for supremacy. But aside from this, the line is very clearly intended to destroy the value of the Taonan-Jehol agreement on which Japan paid China Y.20,000,000 as an advance on the loan for its construction. This line was also handed over by Japan to the consortium during the negotiations at Washington, which once more obligates China to recognize the monetary advances and protect the rights of the consortium. The new line will not touch at Jehol (Changtehfu) but pass some distance to the east on its way into Eastern Inner Mongolia and its terminus at Chihfeng. Both the American and British governments very bitterly opposed Japan's right to build the Taonan-Jehol line and rejected her plea that it was necessary for the proper protection of China and Japan against "the menace from the direction of Urga." Japan also had the right to build a branch that would have connected this line somewhere in the Jehol district with the sea, the

intention being to have its outlet near Chinchow. The new line will tap the richest districts tributary to the Taonan-Jehol project. Now it may be that a British company can step in and take over rights that have caused so much international hard feeling and on which large sums have been advanced; but we doubt it. If the British government should fail to disapprove this contract, the Japanese government will undoubtedly protest it and in this would have the support of the American government through whose initiative Japan was influenced to surrender her rights to the Taonan-Jehol line. Japan paid Y.40,000,000 to China as an advance on the loans required to build the Mongolian and the Shantung railways and was compelled through the pressure of the other powers to surrender these rights and pool them with the consortium. She also waived her right and that of the consortium to the Chefoo-Weihsien line, provided that it be built with Chinese capital. Japan has not received one cent. of interest on her advances, and to date China is in default nearly Y.20,000,000 on interest alone. Yet the Chinese gleefully hand over the rights that has cost Japan about Y.60,000,000 in order to obtain an advance from a British company. And there are many writers who will defend China and call upon heaven to support her in any scheme that will place Japan in the position of opposing the "open door" doctrine.

The names of the interested Chinese are not given. They are simply designated as "the promoters." It is understood that the parties to the Chinese side are officials and gentry of the towns and villages traversed by the line, which, if true, is evidence that the ministry of communications and the Peking cabinet have revived private railway ownership and that a company duly registered and licensed has been organized and represented by the so-called "promoters." In such a case, a loan would have to be a purely private transaction without any guarantees other than the employment of a British chief-engineer, chief-accountant and traffic manager. The Waichiaopu disclaimer of any knowledge of the contracts would strengthen the belief that the full story remains to be told. Northern newspapers have hastened to congratulate the British contractor, but until more definite information is available we are inclined to the belief that condolences are more in order.

The Turning of the Tide

FOR reasons we have never fully understood, it is rare that a British editor or writer has a good word to say for Dr. Sun Yat-sen or his cause and this sentiment is echoed by the so-called exponents of American opinion published in China, controlled directly or indirectly by British interests. It is, therefore, a relief to read in American newspapers words of respect and cheer for the man who, despite his shortcomings, stands head and shoulders above all other Chinese leaders as a champion for honest government. There is increasing evidence, if such evidence be needed, that American love of fair play can be depended upon at a crisis to come to the moral support of the under dog in a fight for the establishment of a government, which, however, far it may be from their conception of democracy, is at least the first crude step towards the attainment of a great ideal in Asia.

Somebody blundered when seven American war-ships were rushed to Canton to join in the demonstration to overawe Sun. It is still a mystery how it all happened. The request for their participation did not come from the American consular or naval authorities in Canton. When the British consul at Canton proposed to blockade the port before the diplomatic corps at Peking had formulated their answer to Dr. Sun's first request for a share of the surplus, the American and Japanese consuls declined to participate without the express authority of their governments. Mr. Jenkins, the American consul-general, even telegraphed to his legation that he did not believe the situation warranted the action proposed by the British and French admirals, but in the event that an economic blockade be established it was suggested that America should participate while reserving freedom of action.

The American legation informed Mr. Jenkins that the diplomatic corps did not approve an economic blockade and the legation itself did not favor landing sailors or marines to prevent the seizure of the customs. Mr. Jenkins was furthermore informed that should Dr. Sun seize the customs the consular body at Canton would receive wide powers for action short of actual warfare. While these exchanges were taking place Admiral Washington, then in Philippine waters, received instructions to concentrate all available ships of the Asiatic fleet at Canton, but further orders intervened which resulted in the dispatch of four torpedo boats and two gunboats to the Canton bund. The mystery as to who influenced the Washington authorities to take such a drastic step without consulting the legation at Peking may never be cleared, but for the present it is a public secret that the demonstration was precipitated by the premature recommendation of the British consul-general without consulting his colleagues in the consular body.

The American people have a very good idea of how they were made to appear as the most aggressive partner in this international show of force for the protection of a security in which they have no direct interest. The *Newark Evening News*, one of the best informed American newspapers on Far Eastern matters, after summarizing the Chinese side of the incident, says:

"If the South China leaders are right about it, then what reply can the powers, particularly America, make? They can say, and they have said, that the Peking government is the only recognized government in China. It is—so far as the foreign powers are concerned. In China it is not so recognized. Peking rule is ignored in more than half of the provinces. It is abjectly helpless outside of Chihli province so far as the enforcing of its orders is concerned. The new President, Tsao Kun, purchased his election by the bribery of members of parliament at an admitted cost of more than $1,000,000. Even school children, unchecked, parade the streets of the principal cities carrying banners denouncing the 'money-bought president.'

"It is true that if the powers did not collect the customs revenues and give the surplus to the Peking government under Tsao Kun that government would fall. And the powers hold that then there would be chaos. It could hardly be worse, however, than the confusion worse confounded now existing. Up to date the predictions of the wonders to be wrought in China as a result of the Washington conference have largely failed to materialize.

"Should there be intervention in Canton, perhaps the resultant reaction would be an anti-foreign movement as wide and serious as the Boxer outbreak. That would be unfortunate for the whole world, especially for America, whence came the plan for saving the Far East."

In commenting on the Canton situation, the *Boston Globe* says:

"The situation is not particularly pleasant for Americans to contemplate, as Dr. Sun has earned a fine reputation and there is little reason to think him mistaken about what happens to the surplus revenue sent to Peking. Americans do not relish the use of their flag over the office of a collector of debts which never should have been contracted. The whole business is too messy to be pleasing."

What has America gained by standing solidly with the other powers in support of Chinese militarism? What is the effect upon the Chinese mind as the result of this and the campaign waged for armed intervention in order to strengthen Anglo-American cooperation in these matters? The answer is very simple. America is losing the trust and confidence of thinking Chinese who believe that we are now the worst enemy of their country instead of its most disinterested friend. "With a labor government in England and desire for friendship on the part of Japan, our most dreaded enemy at present is the United States," remarked one of the foremost Chinese business-men of Shanghai the other day.

This opinion will spread rapidly and Americans will pay heavily for the crude handling of a very delicate situation by a small clique who passed vital resolutions affecting the interests of the whole community without reference to its wishes. It is the turning of the tide.

The Boxer Indemnity

SINCE it became known that the American government would return to China the balance of the Boxer indemnity, advocates of various philanthropic schemes for its expenditure have been camping in Washington in order to press the merits of their respective plans on congress. All these proposals are praiseworthy but we hold to the belief that if this further concession is made to China, the greatest good to the greatest number should be the controlling idea in deciding its expenditure. Educating young Chinese in American colleges is a worthy philanthrophy, but owing to the absence of opportunities to apply their Western ideas and knowledge, the graduates on returning to China have drifted largely into political jobs where they soon lose their American ideals. Especially is this the case with young engineers whose prospects in their native country are almost hopeless until foreign loans are forthcoming to build railways and establish modern industrial plants. Any scheme that will provide these young American-trained men with an opportunity to exercise their talents on work which benefits the masses of the people should be welcomed if only for the returns in increased trade for our manufacturers.

It is difficult to take sides in the controversy as to the best method of using the balance of the Boxer indemnity fund. If we belonged to the missionary or educational element, we would heartily support any proposal that would divert it to uses that would benefit these special interests. If America was a business nation, the fund might be employed in some manner to settle the Chinese government obligations to American merchants who have been hard hit by China's repudiation or delay in paying her debts. It is almost too much to hope that American altruism will ever soar to the heights of aiding or supporting mere nationals who because of their forced residence in a foreign country for the purposes of trade, have no vote and no country-wide organizations to fight their battles at Washington. Philanthrophy in a broad national sense, that is, aiding, comforting, uplifting and educating the foreigner, comes before our obligations to American citizens. This truth will undoubtedly guide our government in deciding how the Boxer indemnity shall be spent.

Mr. Frederick W. Stevens covering this interesting subject in a pamphlet recently issued by the China Society of America advocates the total remission of an indemnity whose punishment portion has long since been paid. We agree in his conclusion that the terms and conditions of a further relinquishment of the American share of the Boxer indemnity should not be determined without a careful investigation of the whole subject. In mentioning, among other worthy schemes, the carrying out of some great engineering project that will rescue some starving portions of China's millions through river conservancy and flood prevention work together with the construction of roads, we believe that he has placed his finger on the one proposal that will bring the greatest good to the greatest number, provide employment for American-educated Chinese engineers and open up a market for American products that will bring increasing profits to our merchants.

While not recommending any special organization for supervising the expenditure of the fund, we invite attention to the program of the international famine relief committee, as presented in the *Journal of the Association of Chinese and American Engineers*, and which to our mind is the most sensible and equitable solution. Naturally, if the United States is to be the only nation to relinquish its share of the Boxer indemnity the expenditure should be entrusted to some purely American organization. We see no good reason, however, why other nations who seem willing to remit their quota of the indemnity should not combine with the United States and agree on some scheme that will bring lasting benefits to all concerned. If Americans determine to expend their share of the indemnity for road construction, most of the motor vehicle business would undoubtedly go to American manufacturers and create intense friction with their European competitors. There ought to be some way to have this great work internationalized through the remission of a certain sum on the part of the larger powers concerned that will bring equal opportunity in catering to the motor vehicle market so created. Any disposition of the indemnity fund for road or railway construction, river conservancy, or other engineering projects is equivalent to a loan to China for this purpose and gives to any one government making the concession the same preferences in the supply of materials as would obtain under a loan agreement, but without being stipulated. As much as we would like to see the balance of the American Boxer indemnity fund set aside for road construction, that will create a market for American automotive manufacturers, we realize that this gives to them an undue advantage over the manufacturers of other nations, which they would be the first to resent if the shoe was on the other foot. For this reason, we believe that if the American, British, French and Japanese governments could agree on a road building program to be paid for by an equal remission of the Indemnity funds, it would carry out the spirit of the consortium agreement and make for a better understanding. If, at the same time, the surplus customs and salt revenues could also be applied to public improvements pending unification, it would go a long way towards helping China while she is down and out and increase the trade of the country for the benefit of all.

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China's Call to the Engineer

The International Famine Relief Commission and its Program

By O. J. Todd, Member A.C.A.E., Chief Engineer I.F.R.C.

The General Problem

What are China's greatest physical needs to-day ? Briefly she is in want of better means of communication and protection from flood and drought. Under the first head she is in need of land transportation facilities including railroads, motor roads, and cart roads. To protect her people from famine due to perennial floods she needs river control works of a nature that will be true insurance to the farmers and town folk living along these great water courses. To deal with the drought problem, which caused the great famine of 1920-1921, irrigation schemes of various kinds must be adopted and arteries of communication established, so that in extreme situations food can be brought in from more fortunate provinces.

It is not necessary to recount the many disasters due to the floods of the Huai river nor repeat the story of the flood of two years ago that laid that whole valley waste, making a huge lake of a farming area larger than the state of Massachusetts, drowning hundreds of people, and causing a flood loss to China estimated at $200,000,000. The Yellow river has its history of broken dikes, flooding out hundreds of villages in a district, making hundreds of thousands of farming people destitute, and causing the loss of millions in food and buildings destroyed. Other lesser streams have been dealing destruction in thickly settled communities due to the general lack of adequate river control works. The 1917 flood at Tientsin has not been forgotten by the people of North China.

The Present Situation

China's railroads to-day aggregate about 7,000 miles. She needs 100,000 miles as soon as her credit will permit their being financed.

Her only motor roads outside the few large cities on or near the coast are those built during the past three years by famine relief funds. Altogether these total something over 2,000 miles.

Recent military roads that can also be used for automobiles amount to about 500 miles in North China.

Cart roads as a rule are narrow, often sunken, and badly kept up. In the great plain of eastern China many of these roads are made across the fields each year and later plowed over and planted to grain.

Bureaus have been formed to handle specific problems that have to do with harbor improvements, river control, etc. But none of these organizations has gone far in actually carrying out large construction programs though extended field studies have been made by several of them. Some of the worst problems, such as those of the

Yellow and Huai rivers, remain unsolved and without any competent boards for handling the problems they present.

Studies of the irrigation problems of the north where rains are light have never been seriously taken up. Some experimental wells were put down in Western Chihli two years ago as relief measures, but the work ended there.

Some Recent Accomplishments

Due to the political chaos in China the past few years little has been done by either the central government or the provinces in the way of constructing public utilities.

It is true that a short extension of the Peking-Suiyan Railway has been made during the last year and that some double tracking has been done to the Peking-Mukden Railway near the coal region north of Tientsin. But as a part of China's great railroad problem these are insignificant.

Government revenues have also paid for a moderate amount of river dredging and straightening on the Hai Ho near Tientsin. Similarly some river work for the benefit of Foochow harbor has been going on at that point.

While native river bureaus have been partially functioning, the China international famine relief commission has been furnishing funds to the extent of $1,000,000 during the past two years and under the direction of its provincial committees has actually superintended doing the work of closing dike breaks, repairing old dikes, and building new ones along the Yellow river, Han river, Huai river, and other smaller streams.

During the past three years, through the organizations and with the funds of the American red cross and the China international famine relief commission, standard motor roads have been constructed in several of the northern and central provinces. These alone aggregate over 2,000 miles and are supplemented by various military and other roads built by Chinese officials bringing the total of recently built roads up to nearly 3,000 miles. This is about 1 per cent. of China's needs.

One of the most helpful signs is the offer of General Feng Yu-hsiang to contribute soldier labor from his Peking army at a very low rate to repair river dikes between Peking and Tientsin. General Wu Pei-fu has similarly offered to furnish men from his army to put through a comprehensive plan of river control for the Yellow river in the province of Honan, under the direction of the China international famine relief commission.

The Immediate Program

The immediate program is, of course, to place an adequate system of standard highways throughout China: 5,000 miles of trunk lines and an equal amount of feeders should be built every year for the next ten years in the northern and central provinces alone. Of course, no such program can be financed now. As famine relief measures, standard highways will be constructed in the badly affected regions every year. Relief will be thus given in the form of wages for labor on these public works.

As famine prevention measures, work will be started on comprehensive programs for permanently controlling the Yellow river and Han river, the provinces most interested raising most of the funds or furnishing the labor.

Work on the Huai river will also be undertaken by a special committee.

The Yellow river training work is to begin northwest of Honanfu and continue down stream. The Han river control work most needed is in the region immediately above Hankow. Studies will also be made of irrigation schemes for using water from the upper Yellow river.

The above program is about to be undertaken by the China international famine relief commission. The accomplishments of the commission will be in direct proportion to the support given it.

Brief History of the Organization

During the great famine of 1920-1921 several relief societies received and disbursed funds in northern and central China. In the fall of 1921, the leaders of these organizations conferred and concluded that there should be one famine relief and prevention organization. While the China international famine relief commission is an outgrowth of a group of voluntary societies formed three years ago for the great famine of North China, it has been made a permanent institution recognized by the consular bodies, the various missions of China, government officials, and the foreign and Chinese public generally. It is a necessity now and may be for many years or until China has a government that can promptly bring relief to distressed sections.

Headquarters for the China international famine relief commission were established in Peking. To perfect the organization, it was necessary to engage a foreign secretary, a Chinese secretary and an accountant. In the spring of 1923, an engineer was appointed to handle all the engineering problems in northern and central China, thereby eliminating waste and securing the highest efficiency for expenditures made by the commission. The practice of allowing local authorities to plan and execute work had proven costly and unsatisfactory, owing to lack of technically trained men. The problem of building up the engineering staff and getting a few young American engineers into the field is a matter of considerable import. It is confidently hoped that support from America will be forthcoming to maintain three or four such engineers to help carry on the very heavy program that has been outlined by the commission's chief engineer.

Cesspool Politics

The Whyfor of the Whereas

WHEREAS, the presidential campaign in America is now in full swing and, *whereas*, the president now in power, if nominated will be re-elected, be it resolved that now is the time for all good mud-slingers, cesspool cleaners and night-soil gatherers to come to the aid of the opposing party and pursuing their odoriferous calling throw their collection of filth at any and all high officials of the present administration who come within range of their strong right arms. This whereas explains the whyfor of the recent demands for the resignations of Secretary Denby and throws light on the similar attack designed to discredit Governor-General Wood of the Philippines and defeat any possibility of his appearing before the republican convention as a dark horse in the presidential race. For the moment, every republican official is a potential crook, liar or thief in the eyes of the opposition and evidence is eagerly sought at the bottom of the septic tanks of politics in order to justify a public recital of charges under pretext of calling for an official investigation. The object is not so much to bring about an actual investigation that will prove the guilt or innocence of the accused official as it is to get the charges before the public in a manner which prohibits a libel suit and allows enough of the filth to cling to the name of the accused to defeat him or his party at the primaries or the polls.

The resolution introduced in congress urging a full investigation into General Wood's administration in the Philippines will stand and stink as one of the most unkind, ungenerous and wholly uncalled for accusations against an American executive that his ever disgraced the pages of our political history. The resolution scores in detail every act and move made by General Wood since assuming his present post and by inuendo makes him the most sordid grafter who ever held an office of trust under our government. The first whereas of the Frear resolution calls for an investigation into the charges contained in the press dispatches of Mr. Junius B. Wood to the Chicago *Daily News* to the effect that General

Wood had the names of senators, representatives and others prominent in Washington social life who received payment from the Philippine independence fund for espousing the cause of independence, but that these names would not be disclosed until the governor-general concluded the investigation of disbursements made from the million pesos fund voted by the Philippine legislature to bring about secession from the United States. This whereas would therefore appear to be in order, and it is to be hoped that when the time comes the limelight will be thrown on the activities of a bureau with headquarters in Washington through which this "educational" fund was disbursed.

The following whereases include the charges that General Wood has set aside the law: overruled the legal rights of officials as determined by congress under the Jones act and assuming the rôle of dictator both in regard to legislation and of rights and privileges granted to favored individuals and private interests; bringing about conditions that threatened the failure of the Philippine National Bank; endeavoring to turn over the management of the Manila railway to the J. G. White Management Corporation of New York under conditions highly prejudicial to the interests of the Filipino people; to have attempted to force the sale of the Philippine sugar centrals against the protests of the Filipino people and with having maintained an autocratic direction of the Phillipine government through officers of the American army who have no legal standing under the law. Furthermore, General Wood is specifically wherased with having drafted without consultation with the Filipino legislature ninety-eight different bills and of having vetoed twenty-one bills passed by that same legislative body; that various charges have been lodged against his autocratic action in interfering in such legislation; that various members of the Filipino council of state and department secretaries had presented their resignations which were accepted by the governor-general; that in consequence General Wood was indicted by the speaker of the Philippine house of representatives for seeking to establish a government in suppression of the popular will and place his authority over and above the majesty of the law and implant a colonial despotism worse than the Spanish régime; that he took the advice of Mr. Wm. T. Nolting, president of a rival bank, in killing the government banking institution; that he sought to denationalize the Philippine economic organizations, accepting his advice on these matters from Americans who desired to exploit the insular resources on a large scale.

The avalanche of whereases turns for a moment to open up the old and forgotten protests and testimony offered against General Wood at the time of his confirmation after his administration in Cuba, presented by Senator Hanna in July 1912 and preserved in the record of that date; all of which is cited to prove his unfittness for his present appointment and to support the resolution passed by practically all of the Filipino politicians asking for his recall. The tirade then swells into a charge that General Wood's selection for the Philippine post would enable him to reciprocate favors extended him in the presidential campaign of 1920 and that his usurpation of power afforded him exceptional opportunities to repay these obligations; that the subscriptions to his campaign fund included contributions from oil, tobacco, banking, railway and other interests that have an interest in the undeveloped resources of the Philippines; that fifteen times more money was contributed towards Wood's campaign expenses than for the successful candidate and that this enormous preliminary campaign expenditure has never been explained either as to the amount of individual contributions or obligations, if any, incurred through its acceptance; that in the campaign to discredit the Filipino demand for independence the press correspondents in Manila were influenced by General Wood in violation of pledges to that effect made by previous presidents of the United States; that Secretary of War Weeks has endeavored to influence General Wood in favor of special interests in Massachusetts; that in depositing $31,449,219 of Philippine government money in various banks and trust companies throughout the United States, which money was the proceeds of loans placed on the recommendation of Governor Wood and deposited in these banks with the approval of the secretary of war, a profitable fixed deposit is assured these institutions, and is calculated to shape sentiment against Philippine independence through such agencies in their reputed influence with the press, all of which is a strong factor in counteracting the puny efforts of the Filipino people to obtain their independence.

And, whereas, the spectacle of having to support a governor-general out of sympathy with their aspirations is only surpassed by compelling the Filipino people to help support American financial agencies opposed to their independence; that notwithstanding the controversies over General Wood's acts as governor of Cuba, the present secretary of war is his firm supporter; and whereas the Filipino people practically drove the Spaniards out the islands before the landing of the American forces and were publicly promised their independence and that they are on an equality with the great majority of nations in other parts of the world in education, business, governmental experience, square dealing and stability; and that the Moro trouble is a fake in order to divert attention from the independence movement; that this bogey has been invented by Americans to supersede the worn out menace to the islands from Japan, etc., etc., these alleged facts warrant an immediate investigation of the underlying reasons which cast discredit on solemn pledges heretofore given by our government, and incidentally we may add send one more high-minded American leader down his grave with a broken heart.

Such is the reward of great Americans, the compensation for a lifetime of unremitting labor to advance the prestige of the nation and save the Filipino people from the consequences of the folly of a past administration. Our history abounds with such stories. Scores of great Americans have achieved fame at times of great national danger only to have their honor attacked and their reputations besmirched in the closing days of their life by bitter and unscrupulous political enemies. Representative Frear of Wisconsin has presented Major-General Leonard Wood with the cordon rouge of the American legion of honor. But it is safe to say that the man who followed Geronimo and was in at his capture; the soldier who led the Rough Riders to victory at Las Guasimas and San Juan Hill; the administrator who cleaned up and made Cuba a better place to live in; the general who with the courage of his convictions dared to defy a pacifist president and prepare the nation for the great war and paid for his patriotism by being requested to resign the army for physical disability and was canned for his courage; the private citizen who went before the people of America as their favorite candidate for the republican nomination for president in 1920 and then defeated, accepted the post of governor-general of the Philippines to repeat his arduous work in Cuba; the name of that American will go echoeing down the pages of history as one of the nation's greatest leaders, while the identity of the individual from Wisconsin who carried the cargo of Filipino nightsoil from Manila Bay and dumped it in the halls of congress will be drowned in the cesspool of his own making.

* * *

Roosevelt-Matsukata

ON the heels of the announcement of the Mitsubishi-Westinghouse combination comes the news of another important Japanese-American amalgamation of business interests. The new link in friendly relations takes the form of an agreement between the Roosevelt Steamship Company of New York and the Kokusai Steamship Company of Kobe to operate monthly a round-the-world freight service under the name of the Kokusai-Roosevelt line. The details of this agreement were concluded by Mr. Kermit Roosevelt (son of the late president) president of the line which bears his name, on his recent visit to Japan in January. This agreement supersedes one made a year ago between the Kerr Steamship Company, of which Mr. Roosevelt is vice-president, and the Toyo Kisen Kaisha. The negotiations at present under way for the absorption of this latter company by the Nippon Yusen Kaisha made the new deal possible.

The Kokusai Kisen Kaisha is controlled by Mr. Kojiro Matsukata, son of the prince and elder statesman of that name, and head of the Kawasaki Dockyard and other important Japanese enterprises, Mr. Matsukata is one of the most enterprising of Japan's captains of industry, a firm friend of America and advocate of better relations and business co-operation. Mr. Roosevelt's success in effecting the amalgamation was due in large part to the friendly and co-operative spirit towards the United States manifested by Mr. Matsukata, who, in addition, is a great admirer and personal friend of the late President Roosevelt and his family. Both America and Japan are to be congratulated on the outcome of negotiations which links the two nations through the greatest names of their

modern history in an enterprise which can only conduce to a closer and more friendly understanding.

The Kokusai Kisen Kaisha with a capital of Yen 100,000,000 (87,500,000 paid up) owns and operates a fleet of 51 cargo-carriers having an aggregate tonnage of 500,000. Three of these are over 10,000 tons, while 33 are classed at 9,000 and the rest at five to six thousand tons. In the new arrangement the Kokusai Company will contribute four newly built vessels of uniform size and approximately 10,000 tons freight capacity, selected from the group bearing the names of the leading ports of the world. The Roosevelt Company will also place four new Diesel engined steamers on the run. Two of these ships are under construction in Europe and will be ready for operation in May and June respectively.

The new service will be maintained westward from New York, calling at Norfolk and other Atlantic and Gulf ports, Honolulu, Kobe, Dairen, Shanghai, Hongkong, Manila, leading ports in Java and India through Suez and European ports and back to Boston and New York. At present the Roosevelt Steamship Company operates U. S. shipping board freighters under a managing agreement. At its head is Mr. Kermit Roosevelt, with Mr. A. E. Clegg as vice-president and Mr. J. E. Willard (former American ambassador to Spain and father-in-law of Mr. Kermit Roosevelt) and A. B. Roosevelt as directors.

The new combination is a sign of the times and while confined to freight service enters the field as a formidable competitor to the new round-the-world Dollar line and with the proposed amalgamation of the Nippon Yusen Kaisha and the Toyo Kisen Kaisha, foreshadows a new line-up in trans-Pacific shipping that will have a far-reaching effect on Far Eastern trade.

Far Eastern Waterworks Problems

Hongkong, Singapore, Manila and Osaka

THE rapid increase in the population of Far Eastern cities is demanding a corresponding increase in water supply, and in order to meet this emergency many interesting engineering problems are being met and solved. The old sources of supply are becoming more and more inadequate and in island cities like Hongkong and Singapore the engineers have been compelled to seek a solution to their problems on the mainland. Hongkong, in order to expand must seek its future across the bay in Kowloon and derive its water supply from the mountains in the leased territory. This necessitates the laying of water mains under the harbor, and divers are engaged in investigating its bottom with a view to drawing up plans for carrying out the above scheme. Not long ago the *China Express and Telegraph* in an article dealing with Hongkong communications advocated the construction of a tunnel between Victoria and Kowloon in order to facilitate the rapidly growing traffic. The idea is far-fetched and perhaps impracticable at this time—but it may come to that in the end, if Hongkong keeps expanding. This would incidentally solve the water problem for the island colony.

The Singapore Scheme

The new Singapore scheme has been investigated and reported on by Sir Alexander Binnie Son and Deacon and published by the municipal council. In this two schemes have been considered, the Pulai and the Semangar, the latter a tributary of the Johore River. The Lenggui and its tributaries was not considered as the Semangar is situated much nearer Singapore and would yield all the water required without going further afield.

The report on the Gunong Pulai scheme which is ultimately recommended, touches on the main dam site, which has been proved as to foundation, Mr. Binnie's opinion being confirmed by that of Mr. Scrivenor. "Solid rock has been reached at considerably less depth from the surface than was anticipated when the estimate of the cost of the dam was made. The subsidiary dam fills up a col by means of an earth dam with an impervious diaphragm carried to a suitable depth below the surface, and raised above the top water level. This is Pulai II dam. The water of Pulai III is to be diverted into Pulai II by a weir and tunnel, the latter seven hundred feet long. The estimated yield from this reservoir is 6½ million gallons per diem. The water from the reservoir to pass through the clear water basin, 380 feet above mean sea level, thence by the pipe line by gravitation to Pearl's Hill at 165 feet, the length of main being 31 miles. No pumping required for this first instalment.

Further development contemplates the impounding of Pontian Kechil, Ayer Hitam streams I' II and III and Pulai I and Melana. The yield is estimated at 20 million gallons per diem.

Probable Future Requirements

The present water supply of Singapore is about 11 million gallons per diem and therefore this scheme can provide nearly twice the present supply.

Tables have been drawn up extending as far as the next century showing what the needs of Singapore will be at that distant date based on the assumption that the growth of the past years continues indefinitely.

"Table No. 1 contained in our report of the October 9, 1922 closed at the year 1951 and we are of opinion that little practical value can be attached to its indefinite continuation.

"We have been unable to obtain any definite figure from the admiralty officials as to the probable requirements in connection with the naval base but we are given to understand that they will not exceed 1 million gallons per diem.

"We understand that an additional quantity of 1.2 million gallons per diem is reserved as a maximum supply for the state of Johore.

"Assuming that the present growth continues indefinitely, an assumption which we hardly think is justifiable, the water flowing from the Gunong Pulai would meet all requirements for at least 50 years."

The development of the scheme involves six instalments, yielding 6.5 million gallons four instalments of 3 million gallons and a final one of 1.5 million. The first instalment is estimated to cost $12,103,000, the subsequent ones each about 2½ millions, total $22,258,000. All the later instalments involve the construction of pumping stations, and last of all, as the pipe is estimated to carry 12 million gallons per diem, a second gravitation main carrying 8 million gallons per diem. The total of 20 million does not exhaust the possibilities of this area, and it has the great advantage of giving the first 6½ million gallons by gravitation.

The Semangar Supply

Since this scheme has not been recommended it would serve little purpose to give the arguments for and against. Some of the difficulties are the danger of flooding, the necessity of pumping all water up 355 feet. The capital cost is slightly less than the Pulai scheme, but figures given of the cost of pumping and upkeep are in favor of Pulai during the life of the first instalment. Also the water is less pure.

"The final conclusion at which we have arrived is that the Gunong Pulai scheme affords great advantage over any other and should be adopted forthwith.

"It is urgent that a new water supply should be introduced with the least possible delay. All efforts should therefore be concentrated on the completion of the surveys of the Gunong Pulai scheme so as to enable us to supply the drawings, etc., and to allow of tenders being invited at the earliest possible date.

"We are of opinion that no useful purpose would be served by continuing investigation of other schemes," concludes the consulting engineers.

Manila's Problem

In Manila, the water problem is also pressing for a solution while the situation has become more complicated owing to the discovery that the present main crosses an important rift in the earth's surface and that in the event of a severe earth shock this main would possibly be broken, cutting off the city's water supply. The Angat river project, it is said, is situated so that the main would run parallel to the earth faults and thus would be comparatively safe from serious injury as the result of earthquakes.

For several years the head of the metropolitan water district of Manila has been urging the enlargement of the city's water supply facilities, but nothing has been done to carry out this recommendation. Meanwhile the city's population has been increasing while industrial consumption of water has also risen. If more time is permitted to elapse without the necessary increase in Manila's water supply, a serious shortage may occur during a dry season.

During the rainy season the present water supply system is quite adequate, the rainfall being heavy enough to meet all possible current demands. But the Montalban reservior is not large enough to take care of the city demand during emergencies such as periodically occur during the dry period, and on more than one occasion in the past has the Manila water supply come perilously near to exhaustion. With the consumption constantly on the upgrade, a really serious shortage is not beyond the realm of possibility, nor even probability.

Of the various projects for increasing the Manila water supply which have been suggested, the one that meets with most favor among experts is the Angat river project. Engineers declare that at a comparatively small outlay of money—about P.15,000,000—this project when completed will take care of the city's needs for many years to come. As it will take several years to complete the project and as the present supply is constantly becoming less adequate, immediate action towards its consummation is urged by business organizations.

Osaka's Huge Program

In Osaka another huge waterworks undertaking has been investigated and reported on by the local water bureau. This contemplates nothing less than using the waters of Lake Biwa after their discharge from the great hydro-electric plants on the Uji river for supplying the cities of Osaka, Kobe and Sakai with their neighboring towns and villages. The plans provide for the building of an aqueduct which will carry something like 343,000,000 gallons per day. Some notes on the Osaka waterworks appear in this issue of THE FAR EASTERN REVIEW in the article on "Osaka's Municipal Enterprises."

The Racial Issue Revived

JUST about the time Americans and Japanese begin to look ahead to an era of good-will and business co-operation new issues which try the patience of both sides are created by the enactment of some new immigration or land law in the United States or some unexpected anti-Japanese movement in China. Japan has been told in no uncertain manner that she can expand no further. Manchuria, a natural outlet for her increasing millions is closed to her colonization on a large scale; Mongolia offers no solution to her problems of population: she was invited to get out of Siberia and is now told to practice birth control. Does Japan try by legitimate methods to save herself from economic disaster by creating industries or developing mines in China; does she seek foreign loans to develop Korea or her zone in Manchuria, there are Americans who can be depended upon to set up a terrific *yakamashi* and charge her with harboring aggressive designs on the integrity of China; when Japan obtains a few paltry millions for reconstruction purposes this same element hastens to cast suspicion on her motives by spreading the report that the funds are to be employed in obtaining control of China's cotton industry. As soon as one judicial question is decided which clears up some point in the interminable immigration snarl, another issue is immediately created and when a plan is considered by the American congress that will not discriminate against Japan, professional jingoes accuse the government of having surrendered to American capitalists interested in large reconstruction loans and contracts. Just when this issue seems in a fair way to be settled amicably, along comes the United States court for China and challenges her position in the Kwantung leased territory. And so it goes.

No other nation have been subjected to such continuous pin-pricking over such a long period of years as Japan has been compelled to stand from the United States, while the deplorable part of it is that the prevailing anti-Japanese sentiment arises largely from localized conditions in various western states which are seized upon by politicians and agitators in catering to the labor vote. The higher authorities at Washington have invariably recognized the legitimacy of Japan's reasonable demands for equality of treatment, and the Japanese authorities have as often met the American government in any solution of these questions that would enable them to maintain their self-respect.

It is only a few short months since Ambassador Woods departed from Tokyo on an urgent visit to the United States. It was a memorable occasion. Japanese of all classes busily engaged in clearing away the débris of the earthquake and burying their thousands of dead paused long enough in their task to show how much they appreciated the help they had received from America. The American ambassador drove to the railway station through throngs of cheering men and women whose *banzais* came from hearts that were burdened with grief. School children crowded the wharf at Yokohama up to the hour of his departure singing the American national anthem and saluting the ambassador with American flags. This demonstration came from hearts overflowing with a sincere gratitude and friendship, brightened by the hope that an end had come to misunderstandings between the two nations.

Ambassador Woods had carried to the business-men of Japan the message of his government that it welcomed co-operation between the two nations in commerce, finance and industry and that his special mission was to encourage and bring about such partnerships. As a result, the great Mitsubishi firm and the equally important Westinghouse interests came together in a new undertaking for the manufacture of electrical apparatus in Japan: the names of Roosevelt and Matsukata are linked together in a round-the-world shipping venture and other American-Japanese combinations are being considered. Japan has sent her commissioners to New York to arrange the terms for the first installment of a series of loans required for reconstruction purposes while many American concerns have received large orders for materials which represent merely the preliminary requirements for a rebuilding scheme that will take ten years or more to carry out.

Japan is America's best customer in Asia and will continue to be so for another decade or more. American exports to Japan year before last permitted our mills to operate full time and provide employment for the workers. Japan's purchases of American products for the next few years will likewise assure prosperity to countless industrial establishments scattered throughout the country

and provide remunerative labor for hundreds of thousands of skilled mechanics.

Yet we are doing our level best to destroy this friendship and drive the Japanese to other markets for their requirements by catering to the race prejudices of a very small element in our population residing on the Pacific coast. In upholding the constitutionality of the last California anti-alien law aimed directly at Japanese settlers, some 30,000 Japanese farmers will be compelled to abandon 500,000 acres of alnd in California which they have been industriously cultivating. California will remain white, but it is certain that white Americans will never raise the 90 to 95 per cent. of vegetables and fruits now produced by the patient and hard working Japanese.

Probably 30,000 Japanese out of a total of 110,000 residing in the United States will be affected by the California anti-alien land law of 1920 under whose provisions Japanese, either as individuals or corporations in which Japanese are interested, are prohibited from owning or leasing land. This also applies to American-born Japanese children (duly recognized as American citizens) unless they are removed from the guardianship of their parents who are inelegible for such citizenship. The constitutionality of this law has been upheld by the supreme court but its enforcement will not solve the problem for the people of California. It will not rid the state of those Japanese legally entitled to reside there and who, under another ruling of the supreme court are entitled to earn their living in their own way. The dispossessed Japanese agricultural land holders will simply transfer their activities from the farms to the towns and engage in industry where competition with American labor is likely to prove more harmful than if they had remained on the farms where labor is scare.

A bill introduced in congress which excludes Japanese from entry into the country has been favorably reported on by the immigration committee of the house. Before it can become a law, however, it must first pass the house, then the senate and then receive the president's signature. It is difficult to believe that a bill which discards the " Gentleman's Agreement " for a law which specifically excludes and discriminates against Japanese subjects will receive the sanction of the senate or the president, and it is safe to assume that some equitable arrangement that will place Japanese on an equal footing with Europeans will be adopted in order to retain Japan's good-will and preserve our own traditions for square dealing. Japan has lived faithfully up to the provisions of the " Gentleman's Agreement " and to set this aside by the enactment of a law which deliberately questions her good faith can only lead to a situation that will be equally deplored in Japan as well as in the United States. The restriction of Japanese immigration into America to two per cent. on the same basis as Europeans under the 1890 census, would reduce her quota to 240 and involve no discrimination or loss of dignity.

The passage of any immigration law that needlessly insults the Japanese would lead inevitably to a crisis in Japanese-American relations and sow the seeds of a future world war. In a recent debate in the Japanese diet, Dr. Kanasugi warned the government that America was most erratic in her conduct of foreign relations and that it was wrong to base national policy on American good-will and sympathy. " The American-Japanese question has now ceased to be a political issue as far as the Japanese nation is concerned: it has become a question touching on our national dignity which transcends all domestic party differences," says the *Osaka Mainichi* reflecting popular Japanese opinion on the subject. On the other hand, the Japanese minister for foreign affairs in responding to Dr. Kanasugi expressed the opinion that an appeal to the justice of Americans will succeed in bringing about a satisfactory solution of the problem, and in this he reflects the general attitude of the state department, which although officially silent, is reported to be sympathetic with the Japanese viewpoint. The bill raises another acute question with Japan and unless a fundamental settlement based on equality of treatment is arrived at, there is small hope of permanent friendly relations between the two great nations. The Japanese say in effect: " enact all the immigration laws you please. It is your country and you have the right to say who shall enter it, all we ask is that you do not discriminate against us because of our color or other characteristics." Their request is reasonable and just and the sooner an end comes to these periodic recurrences of racial outbursts the better for the peace of the Pacific and the world.

Wanted—A Decision

If France continues to obstruct the holding of the special tariff conference in Peking because of the gold franc or any other issue, let the United States, Great Britain and Japan hold a conference of their own with China and determine upon the revision of China's customs arrangements. If Franch then refuses to pay increased duties it will affect very little, because French trade is only a small percentage of the total.

The unrest apparent in every province, the annoyance to foreign trade from illegal taxation, the impossibility of settling outstanding questions because everyone is waiting for the conference to take place, is costing foreign and Chinese traders too much. Illegal taxation is a damnable proposition because it undermines the very existence of foreign trade in China and the position of the foreigner in the country. But when the Chinese give as an excuse for their failure to enforce the national will on the provinces that the Washington conference agreements have not been lived up to and that one treaty is as good as another—there is no reply. For the Washington conference agreements have been ignored and will remain ignored if the powers wait for French ratification. Great Britain, the United States and Japan are morally bound to see to it that a treaty between China and a foreign power shall not be broken —*by either side.* As it is at present, the Chinese can point to the most important agreements regarding their country ever entered into being delayed in fulfillment, perhaps broken, because of the unwillingness of one power to go through with the deal. The gold franc issue was not brought up at Washington. It has nothing to do with the treaties written there. It has nothing to do with the revision of the tariff. It has nothing to do with any of the questions involved. France and China are members of the league of nations. Let them take the gold franc issue there—but let that be no impediment to the holding of the tariff conference.

Twenty-five Years of Successful Co-operation in Japan

(*Continued from page 87*).

Works, Limited, established in 1908, manufacturing a complete line of wires and cables of every description. It is with this corporation, now formed into a limited company, that the Nippon Electric Company is affiliated.

The Sumitomo Electric Wire and Cable Works, Limited, has a large factory in Osaka, with modern buildings and up-to-date equipment. It was here that the first paper-insulated telephone cable made in Japan was manufactured, and it is interesting and significant that, after the affiliation with the Nippon Electric Company (in 1920), the first quadded telephone toll cable made in Japan was fabricated in these same works, and the Company is now fully equipped to manufacture Western Electric types of toll cable.

The years 1921 and 1922 were active years in building construction for the Nippon Company and the eighth factory, three stories of reinforced concrete, was erected, providing 43,000 square feet of additional floor space. Later, the ninth and eleventh factories (84,000 square feet in total) were started, in anticipation of increased requirements by the government department of communications.

During the past few years consistent work has been done looking toward taking up the manufacture of new and up-to-date equipment for telephone systems.

The manufacturing branch has developed and is working under a functionalized organization; consistent progress is being made in the improvement of protective devices and exhaust systems for removing dust and objectionable vapors, and fire prevention equipment is constantly being improved.

This brings us through twenty-five years of progress; the future holds bright promise for another period of development and progress for the Company.

Osaka Municipal Enterprises

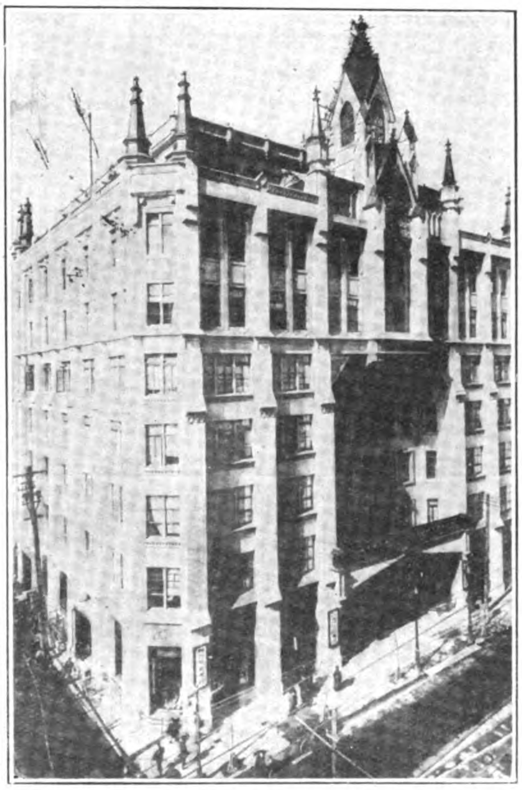
OSAKA, the commercial and industrial heart of the Japanese empire stands on a broad plain midway between Kyoto and Kobe, covering an area of 23 square miles in the southeastern corner of the province of Settsu fronting the island of Awaji and the gulf of Osaka. Occupying as it does, the centre of the empire for national communications, Osaka is the vital point in commerce and industry, and in consequence of its extensive level environs the lands have been largely bought up and utilized for factory sites. As a manufacturing centre Osaka is pre-eminently ahead of all other cities in Asia. Enormous spinning mills raise their towering chimneys everywhere within and without the city and in addition there are factories of vast extent and capacity turning out every conceivable product. The census of 1920 gave Osaka 4,641 factories of all kinds employing 94,982 workers and turning out products valued at Y.558,726,312. Side by side with its industrial progress have grown up great banking institutions that exert an enormous influence in the financial circles of the empire, while houses like the Sumitomo, the Fujita, Konoike and Kuhara are known throughout the world. The trade of the city has trebled since the outbreak of the war, from Y.144,433,590 in 1915 to Y.410,930,441 in 1921. Of this last Y.292,057,917 was exports. With a population of 1,346,471 within the municipal area in 1921, and another two millions or more in neighboring districts, the problems confronting the local governments are many and difficult of solution.

The New Osaka Municipal Building

When the old system of government came to an end with the beginning of the Meiji era, Osaka came directly under the control of the imperial authorities. In 1889 some measure of self-government was accorded to Osaka. The city was divided into 548 streets, which increased to 620 a little later. Subsequently the city was divided into four wards with 903 streets. When self-government was finally conceded to cities, Osaka established a municipal office, a mayor and attendant officials were appointed, and a modern system of city administration began. The mayor has under him two deputy mayors, a treasurer, and an assistant treasurer, and there are eight departments of city government; namely, commerce, industry, education, miscellaneous affairs, waterworks, engineering, sanitation, and accounts; while the electric bureau manager

Mitsukoshi Department Store

Takashimaya Department Store



Shirokiya Department Store

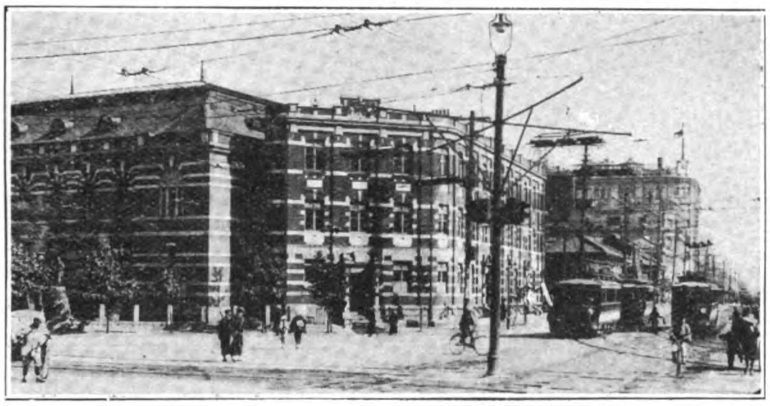
MAGNIFICENT MODERN DEPARTMENT STORES OF OSAKA

the city lighting system and a harbor committee attends to affairs pertaining to shipping. The city administration is directly under the supervision of the mayor, who enjoys a large measure of initiative, but he is bound to consult the aldermen's council in matters relating to finance. The municipal assembly, comprising 60 members, has to pass all important undertakings before they can be proceeded with. There are also ward councils, which manage affairs pertaining to their respective wards.

Bank of Japan at the Oebashi

Court of Appeals

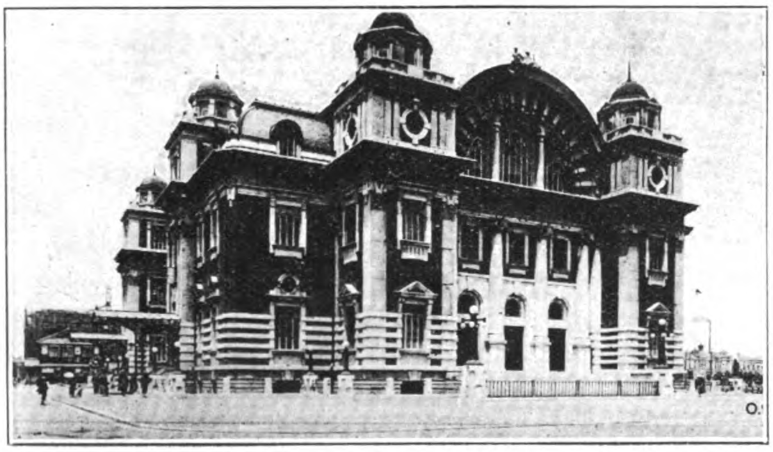
Under the present form of administration various improvements have been carried out in the city, or started with hopes of completion. Among the more important of these is the construction of an adequate system of waterworks and the sanitation of a flat low-lying district difficult of drainage. Last October, the city government took over the private electric light companies and tramways and is faced with many difficult problems involved in their improvement and extensions to meet the constantly growing needs of the community. The figures for 1921 show that the number of passengers carried by the municipal tramways was 267,092,806 producing a revenue of Y.15,223,643 in fares.



Kitahama Stock Exchange

Although Kobe is the deep water port for the Osaka district the requirements of commerce has compelled the construction of harbor works and the improvement of the river for the accommodation of light draft steamers and the thousands of coastwise sailing vessels which carry the products of Osaka to all parts of the empire. Much of Japan's Oriental trade is carried on through the port of Osaka, the home of the great Osaka Shosen Kaisha with its 133 vessels having a gross tonnage of 430,000. The municipality has embarked on a large scheme for still further enlarging its port facilities and when all the piers and warehouses now planned are erected with their cargo handling apparatus, Osaka will take its place in the fore front of Japanese ports.

The following notes on the waterworks, electrical undertakings, harbor program, road and street construction, etc., compiled by our Osaka correspondent from the municipal reports of the current year will give some idea of the vastness of the work confronting the various public works departments.



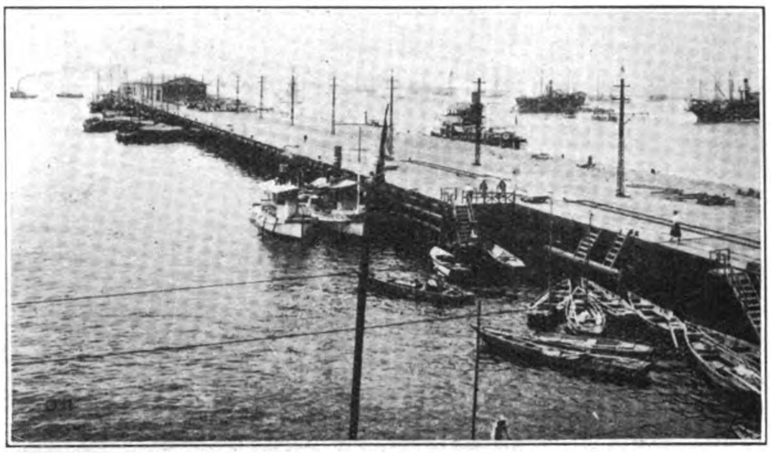
Public Hall of Nakanoshima

Prefectural Government Office

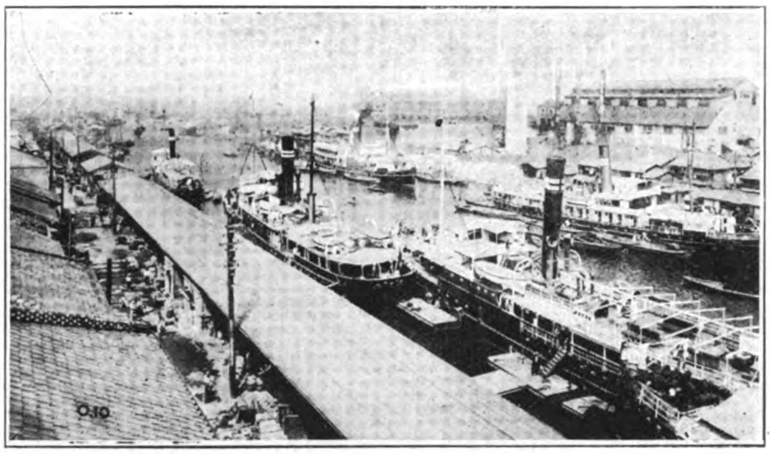
OSAKA'S HANDSOME PUBLIC BUILDINGS

Municipal Waterworks

The city of Osaka obtains its regular water supply from the Kunishima municipal waterworks completed in March, 1922, at a cost of Y.19,880,000. These works cover approximately 125 acres and are composed of two sand filtration ponds, each 49.7 yards long by 11.9 yards wide with a depth of 10 feet, or a total filtration area of 1,183 square yards. There are six intake pumps with a capacity of 464,490 gallons each per hour and three others with a capacity of 659,020 gallons each per hour working against a head of 28 feet, making a total capacity of 1,123,510 gallons per hour. There are ten settling ponds having a total area of twenty acres and a capacity of 63,639,000 gallons : twenty-four filtering ponds, thirty-two acres in extent, filtering 84,640,000 gallons per day : six reservoirs, with a total area of eight acres, having a storage capacity of 27,472,400 each. There are twenty-one distribution pumps (five held in reserve) delivering 4,446,400 gallons per hour in the distribution mains whose total length is over 468 miles. The diameter of the



Another View of the Jetty



The Hustling Banks of the Ajikawa

OSAKA'S BUSY HARBOR

mains ranges from 3½ to 42 inches. The maximum supply per hour is 5,349,000 gallons.

The water supplied by the municipal waterworks for the fiscal year 1922 (April 1922—March, 1923) is as follows. One *koku* equals 39.7 gallons :—

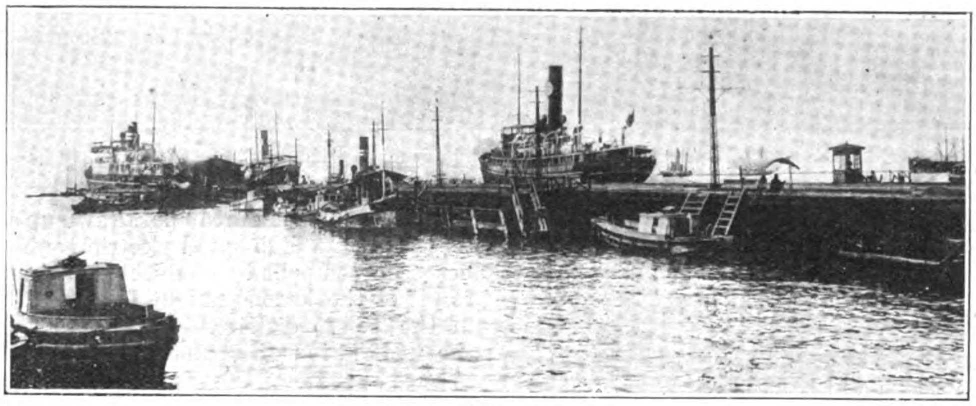
Domestic and business, by private water-hydrant	128,433,600	*koku*
Domestic and business, by common (street) water-hydrant	72,098,259	,,
Public baths	49,655,250	,,
Steam generators	8,749,413	,,
Ships	2,307,651	,,
Government buildings	4,922,996	,,
Military barracks	1,033,705	,,
Fountains and ponds	228,431	,,
Supply in suburbs	44,317,397	,,
Municipal and fire fighting...	116,217,399	,,
Total	427,964,106	*koku*

The average daily consumption for 1922 was 46,548,409 gallons with a maximum demand (August 7) of 58,920,478 and a minimum (January 1, 1923) of 32,255,734 gallons.

Outline History of the Osaka Waterworks

The city of Osaka completed its original waterworks installation at Sakurano-miya in 1895 and commenced its first two-year extension program in 1900. Since then, the system has been continually improved and extended to meet the demand caused by the steady increase of population. During the first five years following the first extension the population outgrew the capacity of the original plant at Sakurano-miya, necessitating the construction of an additional plant to supply the increased consumption. In 1908, therefore, the municipal authorities appropriated the sum of Y.9,480,000 for the construction of the new Kunishima waterworks which was completed in 1916. A further extension was added in 1919 at a cost of Y.10,400,000, the work being terminated in March of last year.

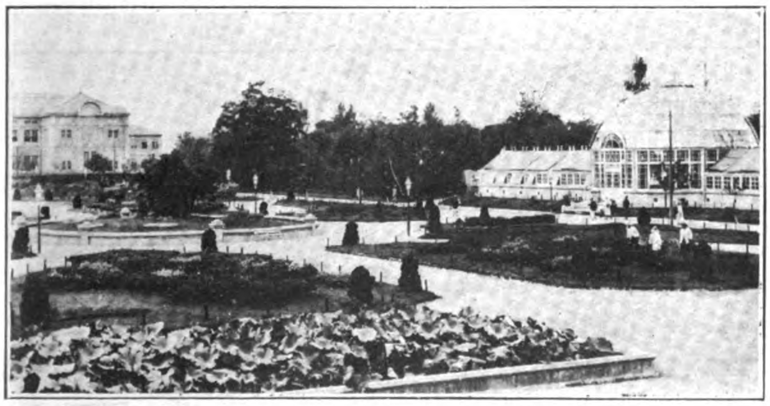
The budget for the current fiscal year is now under examination by Mr. Sawi, chief of the water works bureau, and will be passed together with the general municipal budget by the city assembly. This budget is based on supplying an average of 59,550,000 gallons daily, with a maximum of 75,430,000 gallons. The ordinary expenses of bureau for 1924 are placed at Y.1,187,000 in addition to Y.528,000 for engineering work and improvements while the income is estimated at Y.3,975,000, showing an estimated profit of Y. 2,788,000 for the year. The surplus to be carried forward from the current fiscal year is Y.500,000 giving a total surplus for 1924 of Y.3,288,000. Of this, Y.1,167,000 is to expended for new equipment and meters: Y.1,283,000 for the redemption of waterworks bonds due in 1924 and Y.240,000 for redeeming other bonds issued by the municipality for improving the sewage system and harbor works.



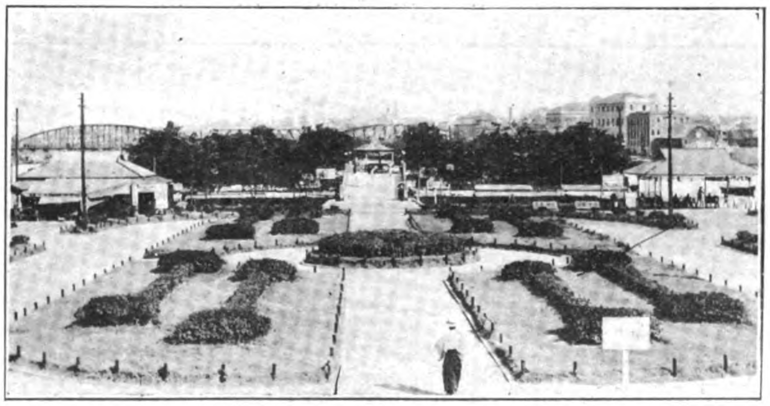
The Deep Water Jetty

Future Plans

The abnormal growth of Osaka with

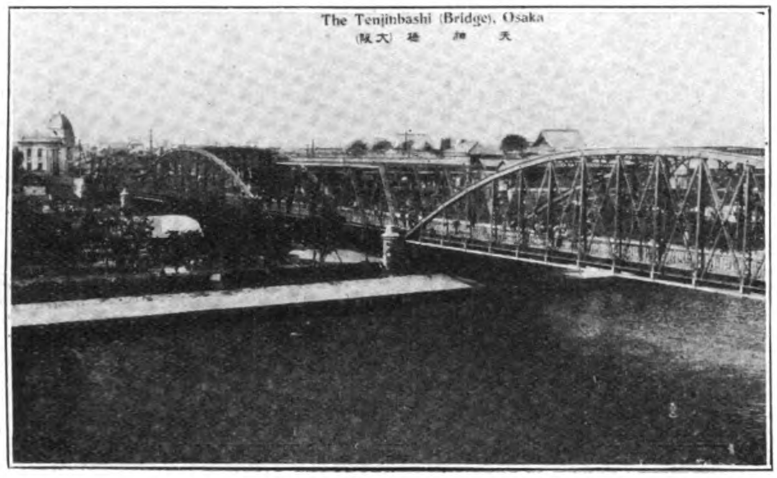


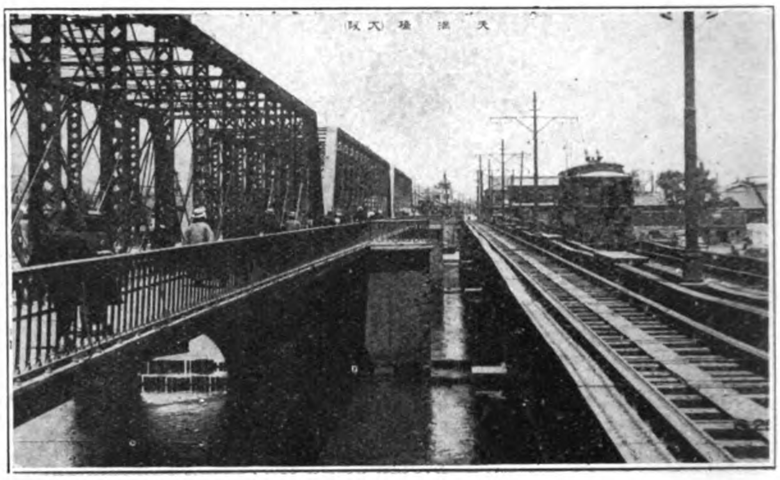
Tennoji Park



Nakanoshima Park

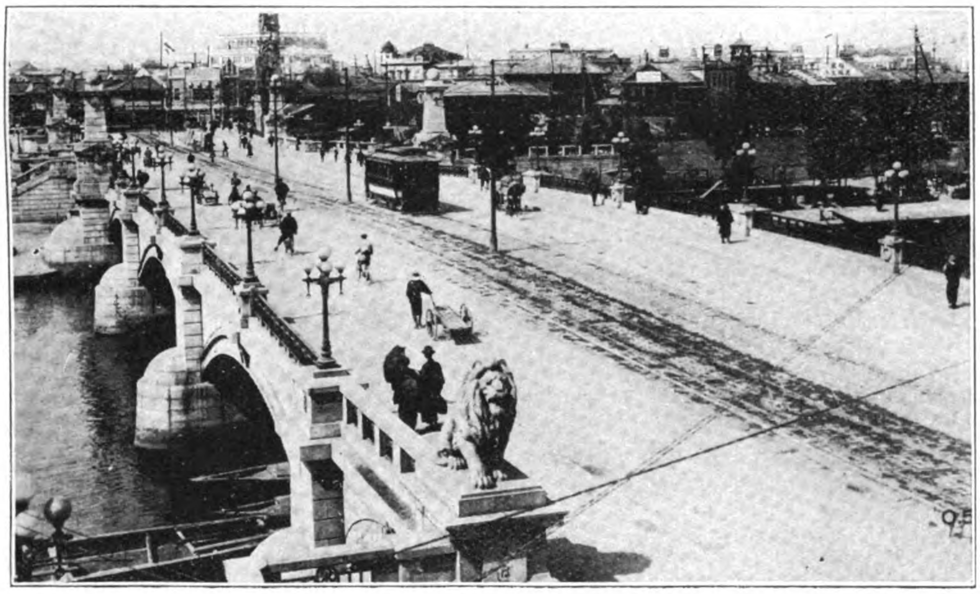
THE BEGINNING OF A BEAUTIFUL PARK SYSTEM





The Tenmabashi Bridge

its great industrial establishments has compelled the engineers to look far afield for a supply that will assure the future development and needs of the city and its dependencies. The waterworks bureau has completed investigations for using the waters of Lake Biwa for a huge program that will supply not only Osaka but Kobe and Sakai with the neighboring towns and villages. Owing to the opposition of the people living in the villages on the shores of the lake to any further lowering of its level, the bureau plans to utilize the waters discharged by the Ujigawa hydro-electric plants located in the lower end of the Uji river. The quality of the water here is excellent the number of bacilli being only 483 as compared with 6,000 in the water of the Yodo river. The quantity to be supplied under the new scheme amounts to 251,800,000 gallons per day distributed as follows :



The Heart of Osaka: The Naniwa Bridge

Districts	Gallons.
Osaka	158,800,000
Kobe	79,400,000
Towns and villages between Kyoto and Osaka ...	2,900,000
Towns and villages between Osaka and Kobe ...	12,300,000
Sakai	8,400,000
Total	261,800,000

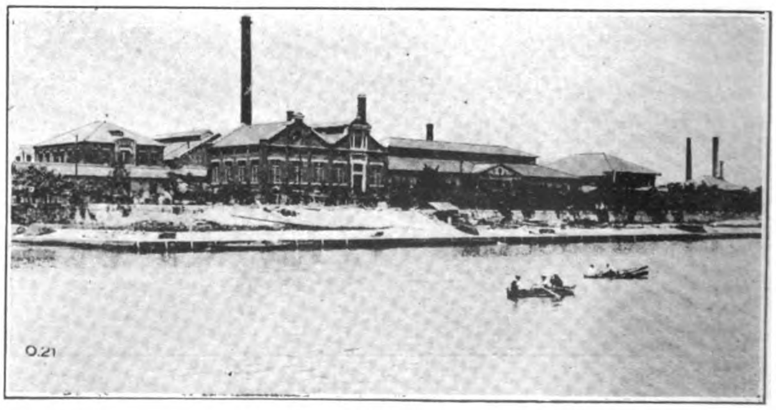
The aqueduct to be built along the left bank of the Yodo river will carry approximately 343,000,000 gallons per day. This location has been selected after careful investigations because of the nature of the soil and lower cost of construction. However, the work as planned at present is to be carried out over a long period of years.

Municipal Electrical Enterprises

After protracted negotiations the Osaka municipal government purchased the properties and rights of the Osaka Electric Light Company and took over and commenced to operate the plant on October 1 last. The operation of the electric railways in and around Osaka was also included in the municipal scheme. The municipal electric bureau has drawn up and completed plans for the operation of a high-speed electric tramway system in the city but has been compelled to subject it to extensive modifications as a result of the lessons taught by the earthquake of September last in the Tokyo district. One of these modifications will embrace the installation of an underground tramway system.

The electric bureau has recently decided to adopt the single hanging wire system for the municipal tramways and equip all the cars with a single trolley pole and better safety guards. At the end of July, 1923, the city had 464 single tram cars, 150 ordinary

The Kema Komon (Lock Gate)



The Mint, Osaka

bogie cars 245 low truck bogie cars, 20 watering and 6 freight cars, a total of 885. In addition, the bureau plans to acquire 60 bogie cars during the coming fiscal year. The daily average operated during July, 1923 was 82,330.66 miles. The bureau employed 1,203 drivers and 1,752 conductors at the end of July, 1923.

The following table compares the length and cost of construction of the tramways in the city of Osaka, according to report made at the end of July, 1923:—

The names of lines.	Operated milages. (miles)	Cost of Constructions. Yen
Chikko (Harbor)	2.14	620,575
East and West	2.78	1,068,624
South and West	4.40	1,408,397
Nakanoshima	2.83	1,370,924
Uehonmachi	1.81	602,429
Tanimachi	0.97	433,535
Sonezaki	2.56	1,527,349
Kitahama	1.12	787,030
Tamatsukuri	0.71	456,695
Sakai-suji	2.00	4,559,666
Utsubo-Honmachi	2.07	4,105,498
Tenjinbashi	1.62	1,809,368
Kujo-Kozu	3.72	3,581,083
West-Dotonbori to Tennoji	1.69	1,093,846
Tennoji-Ajikawa	1.08	759,998
Namba-Kizu	0.85	459,627
West Noda	0.93	607,528
Noda	0.47	369,513
West Noda-Fukushima	0.48	191,669
Matsushima-South Okajima	2.88	1,737,105
Kasumicho-Tamatsukuri	2.95	2,223,539
West Noda-Sakurajima	2.35	2,154,877
Sakuragawa-Nakanoshima	1.5	2,975,076
Umeda-Zengenjimachi	1.6	1,826,805
Ajikawa-Chikko	2.13	1,246,679
Tenmabashi-Zengenji	under construction	487,639
Tsurumachi	2.2	555,604
Northern seashore of Osaka harbor (single)	0.5	63,147
Tanikawa-Neyagawa	under construction	152,439
Uehonmachi-Shimo Ajiharamachi	do.	55,134
Tennoji-Abeno	0.4	313,275

The business result of the municipal electric railways during the fiscal year ending March, 1923 :

Income through operation of tram-cars	Y.16,248,813
Other income	1,184,923
Total	Y.17,433,736
Expenditure of operating tram-cars	Y. 8,381,760
Other expenditures	261,287
Total	Y. 8,643,048
Excess of income (profit)	Y. 8,790,688

Operation of Municipal Tram-Cars. (April, 1922—March, 1923).

		Daily Average
Aggregate milage	51.86 miles	
No. of cars operated	253,697	696
Operated milage	28,116,175 miles	77,031.16 miles
Number of passengers	285,632,624	782,555
Income, fares	Y.16,245,499	Y.44,508

Sewage System

The construction of a sewage system was begun in 1894 and completed in November, 1899, covering practically all parts of the old city of Osaka. Construction in the suburban districts was commenced in 1911, and completed in 1922 at a cost of Y.6,000,000. The city planning bureau of the municipality is engaged in the construction of a sewage system in the rapidly growing suburbs of Western Noda, Ichioka, Izumio and Sangenya districts. This work was which was started in 1922, to be completed in 1924, at an estimated cost of Y.4,600,000.

The total length of the main sewage system in Osaka, at the end of 1922 fiscal year was 399,257 yards, with 100,152 yards of branch connecting to dwelling houses. The total capacity of the sewage system amounted to 49,843,258 square yards.

Osaka Harbor Program

The program for the construction of an adequate harbor for Osaka was commenced in 1897 with an appropriation of Y.18,120,000 from the imperial treasury to cover the expenditures over a period of eight years. In 1905, an additional appropriation of Y.9,200,000 was voted and the date of completion extended ten years. Because of financial conditions following the war the time has again been extended. The development of industry and commerce as a result of the war with great cargoes of merchandise and machinery entering the port of Kobe for the chief industrial centre of Japan together with the vast volume of exports from that section necessitated the utilization of Osaka's port facilities and the construction of railway spurs from the main lines to the wharves and warehouses. A plan of development was approved of and financed by the imperial government, but at the same time the Osaka municipality coming into possession of a large financial surplus as a result of prolonged prosperity decided in 1917 to expend Y.8,220,000 to complete the harbor within six years. This, like many other ambitious schemes promoted during a period of prosperity, had to be abandoned with the sharp rise in prices of labor and commodities. In 1920, the municipality passed a budget providing for Y.3,100,000 for the carrying out of work contracted for together with an additional Y.15,750,000 to complete the entire harbor program by 1926. The imperial treasury assisted in the financing by conceding an ample subsidy. In addition to the above plan, the municipality, aided by a donation from the Osaka Shosen Kaisha, constructed a passenger pier on the northern side of the harbor, which was completed in April-1922 at a cost of Y.290,000.

In December last the harbor construction bureau received permission from the department of home affairs tou ndertake the reclamation of 1,250 acres just outside the northern jetty of the port and to the west of the Sakurajima reclaimed area, on condition that the work be started within six months from the date of sanction. It is announced that this work will be commenced sometime in March or April. This extension to the reclaimed area has long been incorporated in the program of the harbor construction board which plans to complete the job within five years at a cost of Y.4,000,000. When completed, it will create a basin between the new and the old Sakurajima reclaimed areas and will be crossed by several canals. The ground will be used for the erection of warehouses, factories and offices in addition to providing a spacious storage yard for the harbor construction board. To expedite this work, a canal 60 yards wide will be cut through the northern jetty in order to provide passage for mud scows and dirt barges.

Apart from this municipal scheme there is also a private project to dig a canal to connect the Shorenji-gawa with the harbor and which a permit has been applied for. A dockyard and quay on the northern side of the harbor is also being constructed under contract by the Sumitomo firm at a cost of Y.3,100,000. The following table gives some figures of the present Osaka port facilities :—

Water area	1,807.5 acres (2,169,000 *tsubo*)	
Depth of water	28-ft. and upward.	
Reclaimed land	1,055.6 acres (1,266,675 *tsubo*)	
Main pier	489.6 yds. long,	29.7 yds. wide.
T shape pier	35.6 ,,	5.9 ,,
Sakurajima iron pier	79.2 ,,	11.8 ,,
Sakurajima iron pier	138.6 ,,	11.8 ,,
Sakurajima wharfage	203.9 ,,	8 ,,
Tempozan pier	136.6 ,,	9.9 ,,
Watashi pier	15.9 ,,	7.9 ,,

Canals :—

Canal through reclaimed land, aggregate length 7,920 yds. The shallowest depth at low tide is 7-ft.

Tempozan canal (connecting Aji-gawa and Shirinashi-gawa); 2,289 yds. long and 49 yds. long.

Branch canal of Tempozan, (connecting Tempozan canal and inner port of Osaka); 408 yds. long and 79.2 yds. long.

Fukumachi moat	1,148.4 yds. longs,	39.6 yds. wide.
Kitsu-gawa canal	1,996 ,,	87.2 yds. ,,
Chitose canal	2,079 ,,	59.4 yds. ,,

Warehouses and customs sheds :

Warehouses: municipal, 5,374.7 sq. yds. 2 houses. Private, 87,374 sq. yds. 90 houses.

Customs sheds: Municipal, 33,454 sq. yds. 14 houses. Private, 62,732 sq. yds. 38 houses.

Roads and Streets

Street maintenance and construction in the city of Osaka is supervised by the municipality, outside the city, limits by the

prefectural authorities. According to a report made in June, 1923, the area and length of the streets under the administration of the municipal public works bureau was as follows :

STREETS WITHIN THE CITY OF OSAKA

Kinds	Area. (In sq. yards.)	Length. (In yards.)
National streets	43,266.6	5,900
Prefectural streets ...	38,988	5.385.5
Municipal streets ...	3,710,893	
Length of the municipal streets with width of 1.98 yards and upward		607,028.5
Width under 1.98 yards...		48,557.6

The total length of streets within the city of Osaka, was 667,871.6 yards with a total area of 3,793,147.6 square yards. With the streets belonging to the harbor office, and those used for railway construction the total area amounts to 5,070,000 square yards.

The municipality proposes to spend approximately Y.2,500,000 during 1924 for the construction of new and the rebuilding of old streets, and although complete plans for new street building have not yet been approved by the higher authorities work will proceed in accordance with plans already passed upon.

The municipal government has sent delegate to Tokyo to obtain the approval of the imperial authorities for the floating of a bonds to the value of Y.5,000,000 the proceeds to be used for city improvement. Chief Okazaki of the municipal general affairs bureau, believes that the city will be able to spend this year some Y.27,000,000 for public works, including the construction of roads.

The following is the list of street improvements that remain to be completed :—

1. The Mido-suji (In 1924 that section between Yodobashi and Honmachi-suji will be completed.)
2. Kujo-Umeda (From Higo-bashi to Kujo.)
3. North-South street (From Higobashi to Minato-machi.)
4. Jonan (from 3-chome, Tani-machi to Morinomiya.)
5. From Daikoku-machi to Kansai (all.)
6. East-West street (Uehom-machi to 6-come, Tani-machi.)
7. Osaka street (From Matsuya-cho to Tennoji.)
8. Umeda-Tenma (From Umeda to Ogibashi, past old prison.)
9. Tamatsukuri to Noe (all.)
10. Sakura-no-miya (all.)
11. From Edobori to Joso (From Edobori to Tokaido-suji.)
12. From Kujo to Honda (all.)

Of these projects, several are expected to be completed by the end of this year.

The Osaka prefectural government has drawn a draft plan for constructing broad inter-urban streets, radiating from the city with a program to complete them during 11 years, beginning 1924, at an estimated cost of Y.39,786,555. The following table compares the year and its individual percentage of completion :—

Years :	Percentages.	Years :	Percentages.
1924...	0.001	1930...	0.112
1925...	0.064	1931...	0.103
1926...	0.090	1932...	0.113
1927...	0.097	1933...	0.127
1928...	0.105	1934...	0.071
1929...	0.113		

Parks and Playgrounds

There are about 14 parks and public playgrounds in the city of Osaka, with an aggregate area of 33.6 acres, costing about Y.456,700. The names are as follows :

	Names.	Location.
1.	Municipal playground.	Yawataya-machi, Nishiku.
2.	Yodogawa park.	Kawasaki-machi, Nakano, Kita-ku.
3.	Nakanoshima park.	Nakanoshima, Higashi-ku.
4.	Ten-noji park.	Tennoji.
5.	Okura-ato small park.	Okuramachiato, Minami-ku.
6.	Shimizudani small park.	Shimizudani, Higashi-ku.
7.	Kitano small park.	Kitano, Kita-ku.
8.	Noda small park.	Nishi-Noda-machi, Kita-ku.
9.	Awaza small park.	Awaza, Nishiku.
10.	Kujo small park.	Minami-dori, Kujo, Nishi-ku.
11.	Nishi-Kujo small park.	Nishi-Kujo, Nishi-ku.
12.	Kizu small park.	Kizu, Minami-ku.
13.	Chikko garden.	Shijo-dori, Nishi-ku.
14.	Ohgimachi, park.	Ohgi-machi, Kita-ku.

	Area (in *tsubo*) (One *tsubo* equals 3.95 sq. yrds.)	*Cost of Construction.* (In yen.)	*Equipment.*
1.	12,000	40,000	General sport equipment.
2.	5,000	20,000	Swimming pool.
3.	6,500	30,000	Tennis court, etc.
4.	5,000	20,000	General equipment.
5.	418	28,738	,,
6.	801	34,575	,,
7.	419	28,389	,,
8.	378	28,450	,,
9.	519	45,327	,,
10.	1,006	73,660	,,
11.	2,061	75,019	,,
12.	704	11,289	Track field.
13.	5,000	6,318	General equipment.
14.	490	15,000	General equipment.

The necessity of creating large parks having been driven home by the recent disaster in Tokyo, the city planning bureau is now studying a plan to create a system of parks, the extension of which will ultimately total 3,500,000 *tsubo*, or 2,916.6 acres. The outline of the plan as reported is as follows :

1. *Yodogawa Park.*—The Yodogawa river banks will be converted into the Yodogawa park, extending from Hirata, the northern end of Moriguchi, to Dempo, including Morikoji, Honjo, Akagawa, Kema, Kitanagawra, Toyosaki, Sagisu on the left, and from Kita-Omichi down to Fukumura, including Toyosato, Nishinakajima, Kunishima, Joso, Hiyejima on the right.

2. *Sone Park.*—At the eastern part of Sone along the river.

3. *Senriyama Park.*—On the plateau of Senriyama, in the northern part of Suita.

4. *Aigawa Park.*—Along the river of the same name south of Suita.

5. *Nevagawa Park.*—Along Neya river including towns and villages from Tokuan to Imafuku.

6. *Tanabe Park.*—At Tanabe around Monoyama Middle School.

7. *Yamatogawa Park.*—Along the Yamato river to the north of Sakai city.

8. A chain park in South Osaka, including Ten-noji, Shoten Hill, Abeno, Tezuka Hill, Sumiyoshi Shrine.

Investigations as to the cost of this plan are making headway. Osaka plans to construct a road connecting all these foregoing parks from Mino-o park, Hamadera park, touching Nishishoji, Nobatake, Juso Bridge, Ten-noji, Sumiyoshi, at a cost of Y.80,000,000. This plan is still in the air owing to lack of finances. The prefectural government, however, has started to re-model Hamadera park as an initial step.

Americans Obtain Amur Gold Rights

Prospecting rights in approximately 3,500 square miles of placer gold fields in the Amur basin have been conceded to the Far East Exploration Company headed by Henry T. Hunt of Cincinnati, says a Moscow dispatch. The concession was obtained by Charles H. Smith, former American member of the Chinese Eastern Railway commission. Mr. Smith is now in Moscow.

The company expects to begin work in the spring, but its rights are available until January 1, 1925, after which date it must make a final contract, meanwhile paying from 5 to 8 per cent. royalties in addition to an acreage charge. The fields were last worked in 1915.

* * *

Big Fire Fighting Engines for Tokyo

Five fire engines made by the Allen Fox, the Staat, and the Le France Companies in the United States have been delivered to the fire brigade headquarters of the Tokyo metropolitan police board. They were ordered to replace in part the 13 Tokyo fire engines destroyed in the earthquake.

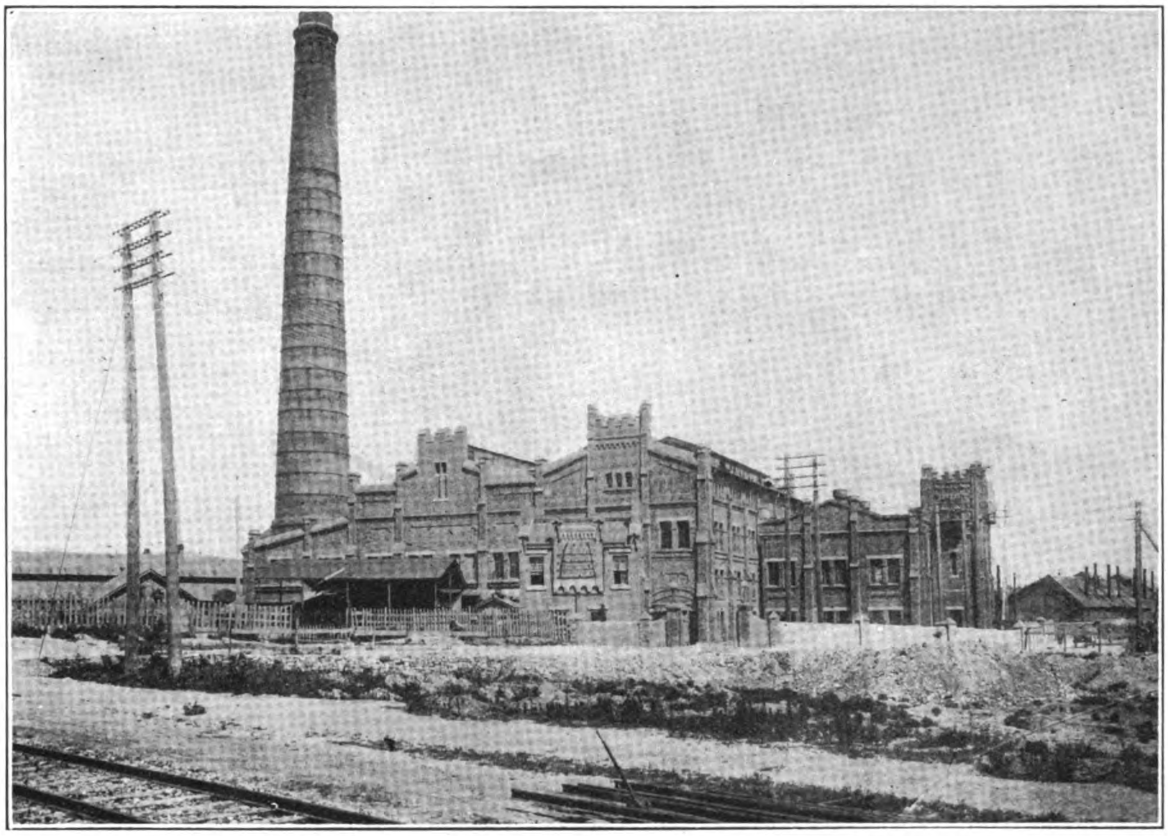
The newly arrived engines can each throw 750 gallons of water a minute, and are of 75 horse power each. Other fire engines able to throw more than 1,000 gallons a minute will arrive from America within January on February.

Electrical Developments in Manchuria

ENTERPRISE OF THE S.M.R.

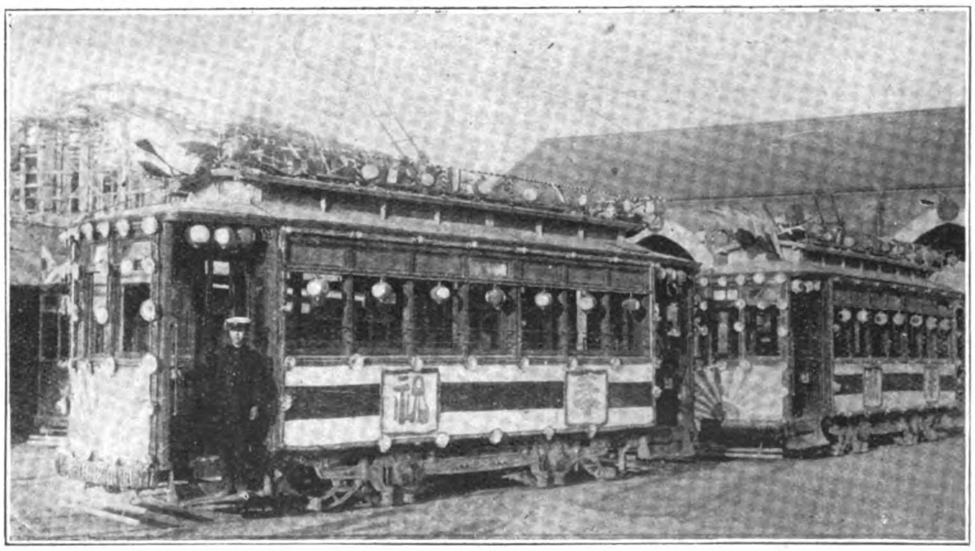
The Yalu River Hydro-Electric Power Project

WHAT promises to develop into one of the most important electrical enterprises of Asia is now being investigated by the experts of the South Manchuria Railway Company. About 100 miles above Antung near Igen in Korea the Yalu River is full of rapids that will give 35,000 horse-power during the summer season and at least 10,000 horse-power when the river is ice-bound. No dams are necessary for the accomplishment of this undertaking, while the rock required for tunnels and canals is found close at hand and easily worked. Eight kilometres below this site there is another rapid capable of furnishing another 20,000 horse-power. The railway company is encouraged in carrying out the scheme by the success of the Seoul Electricity Works in bringing power from the Diamond Mountains, a distance of 102 miles.



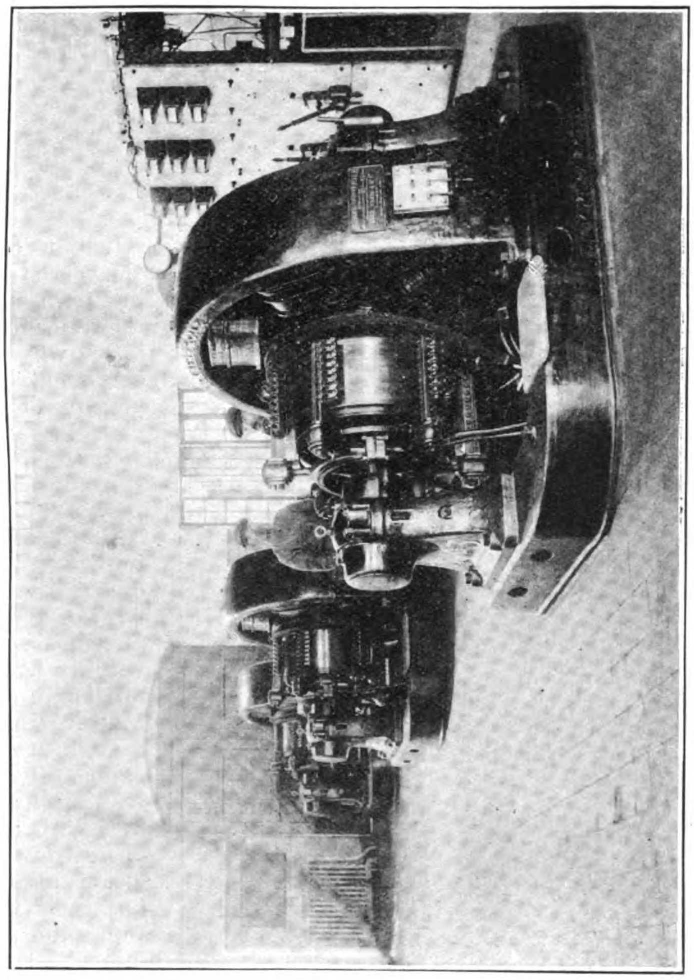
Main Power House of the S.M.R. Electricity Department at Dairen.

The Korean government has also established a special office for developing the hydro-electric resources of the peninsula, and its investigations indicate that out of an estimated available total of 1,000,000 horse-power, the Yalu River with its tributaries is capable of supplying two-thirds, or about 700,000 horse-power. The scheme has naturally created considerable discussion in Japanese engineering circles. Its success will hinge upon the ultimate cost of power to the consumer. The distance from the site of the proposed power house to Antung being 120 miles, the cost of erecting transmission towers and lines and transformer stations will materially increase construction costs and compel a high charge for current. In Japan the cost stands between 3 to 5 sen per kilowatt for power and about ten sen for lighting. The maximum distance which power can be transmitted at a profit is placed at 200 miles, so there is no reason why the Yalu proposition could not be made to pay. Mukden is only 160 miles in a straight line from the site of the proposed power plant and all other important industrial centres of South Manchuria are within transmission distance. However, in these regions all electrical generating stations are operated by steam obtaining their fuel from the almost inexhaustible coal mines of Fushun. A fuel famine in Manchuria is a remote possibility. On the other hand, Japanese engineers say that the coal reserves of Japan are dwindling and will be exhausted in another century. Wherever possible, all enterprises in Japan should be operated with electric power so as to save the home coal supply. As there are specific industries which must always rely upon coal for generating power, the Fushun mines will be more and more called upon to meet the future demands of Japan and any plan which will help to preserve this reserve for the use of Japan should be encouraged.

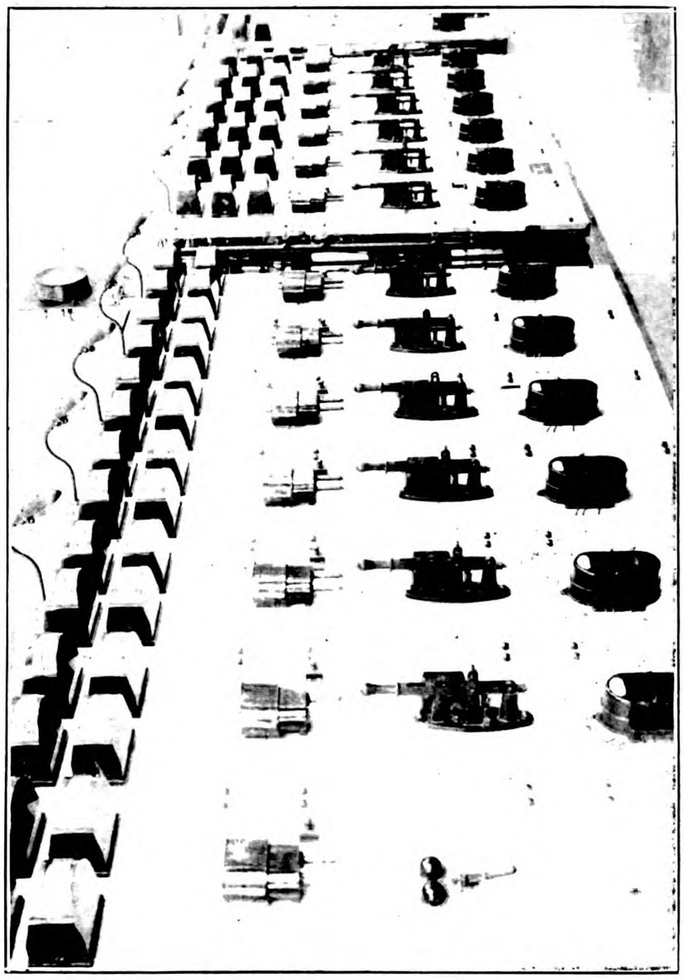


Dairen Tramcar Decorated for Festival Day.

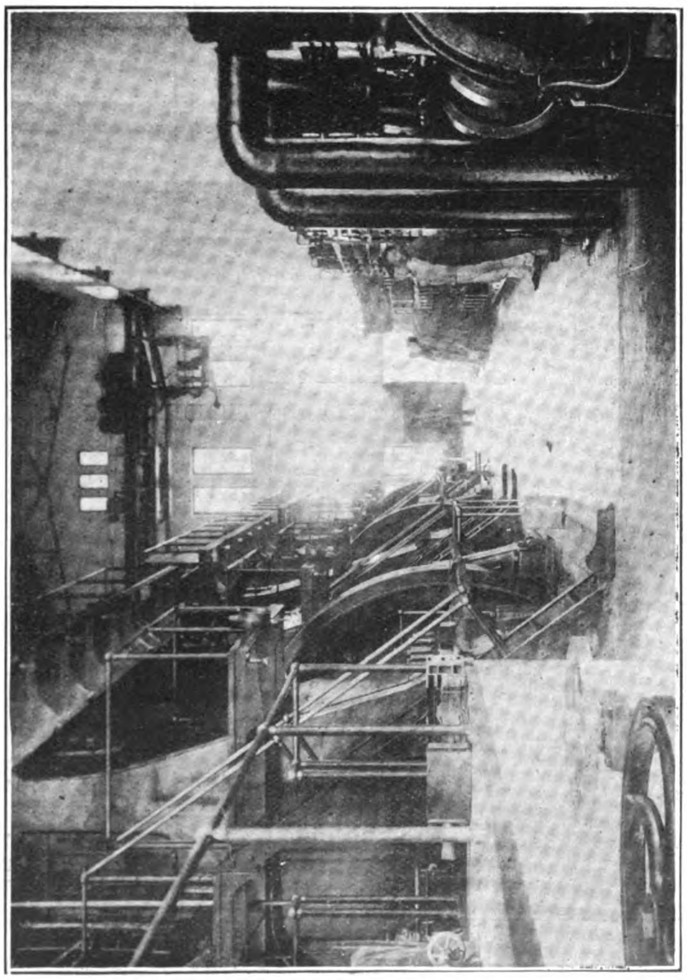
The initial success of the Yalu power scheme must depend largely upon the development of Antung as a manufacturing centre. At present only about 2,000 kilowatts are consumed at this port, but it is hoped that by sup-



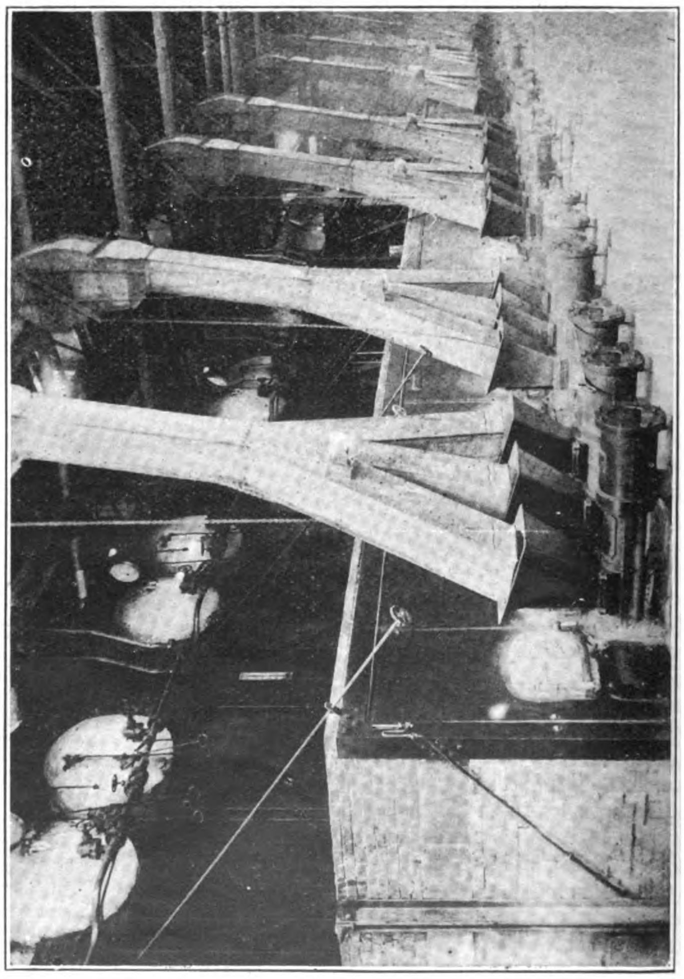
Rotary Converter Room, Hamacho Power Station, Dairen: 3 sets, 400 kw., 550 volts.



Switchboard, Nagatomachi Sub-Station, Dairen.

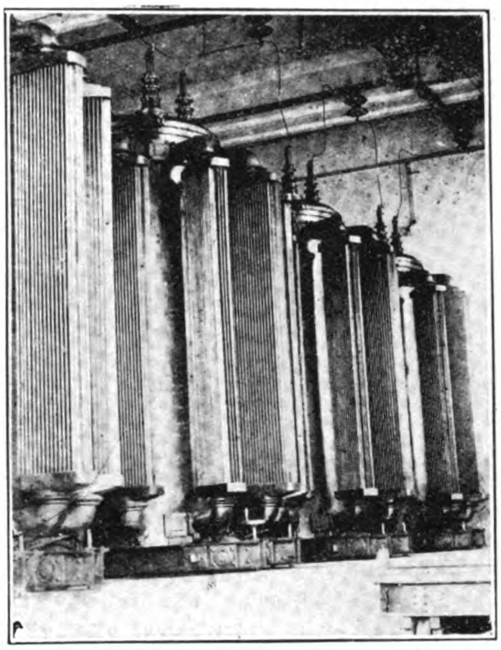


Generator Room, Hamacho Power Station, Dairen: 3 sets, 1,000 kva, 2,300 volts and 2 sets, 1,875 kva, 2,300 volts.

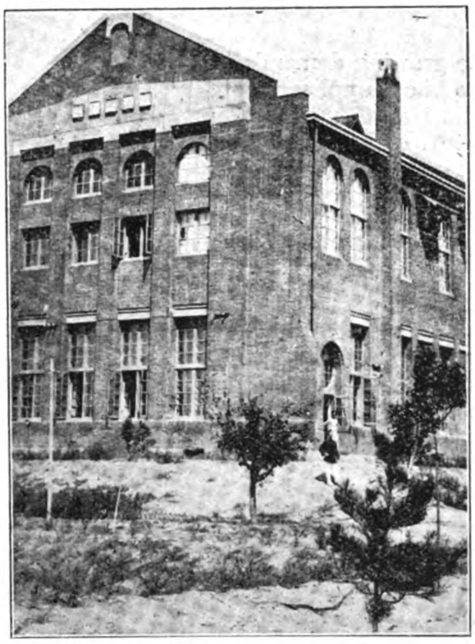


Boiler Room, Hamacho Power Station.

plying current at a sufficiently low rate, foundries and other industrial establishments now idle will be galvanized into activity. The electrification of these established industries alone will call for about 10,000 kilowatts. Mines which are now closed down will also re-open with greater prospects of prosperity.



Transformer Room, Sub-Station, at Fushun: 4 sets 1,000 kva, 44,000 volts

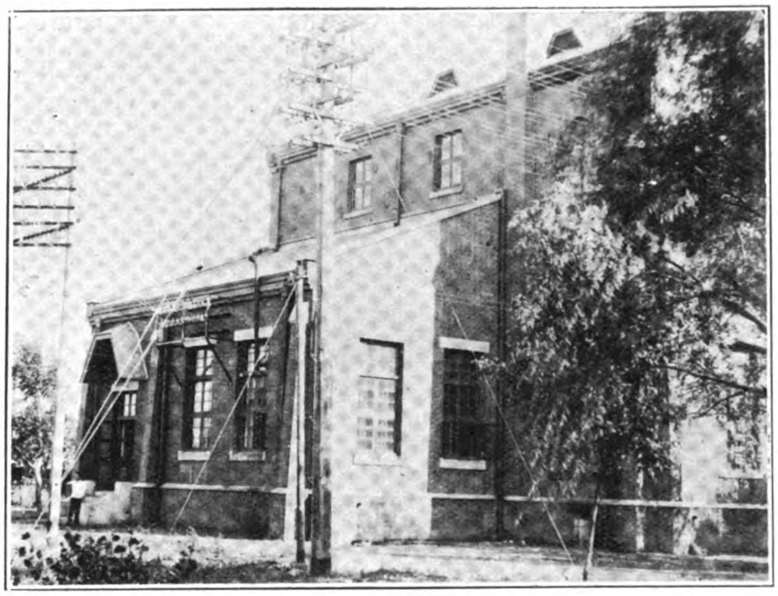


Fushun Sub-Station, Outside View

Another obstacle confronting the Japanese in carrying out this scheme is the fact that some of the most desirable power sites are on the Chinese side of the Yalu and all transmission lines into Manchuria will have to cross Chinese territory. However, a start can be made with power stations on the Japanese side of the Yalu to furnish power to Antung and develop that port into an important industrial centre. There are also sufficient sites on the Korean side of the river to provide power for industrial purposes within territory under Japanese jurisdiction. There is an ample field for its consumption in the rapidly growing industrial city of Ping-yang.

Electric Bulb Factory Projected

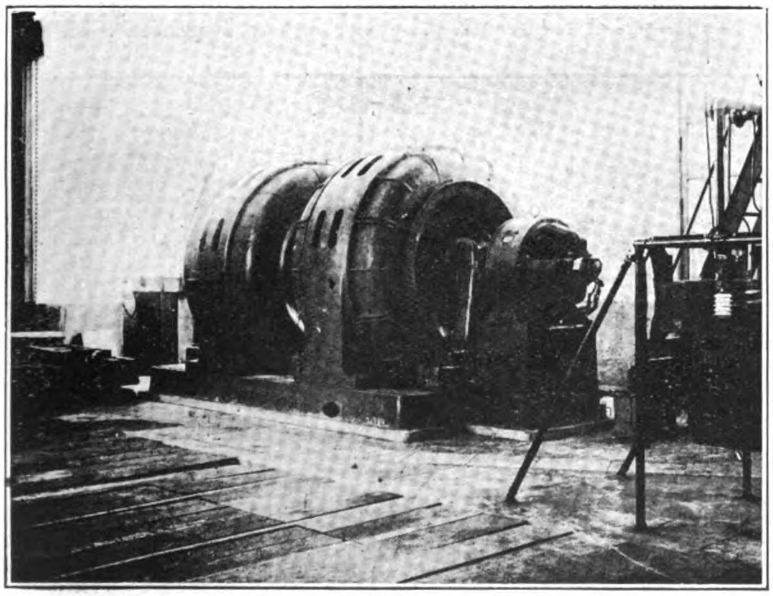
Considerable interest is being displayed in Dairen over the manufacture of electric light bulbs in that city. The electric repair shops of the South Manchuria Railway attached to the Shahoku Works operates its own bulb factory turning out about 150,000 lamps per year. The supply of bulbs hitherto has been almost monopolized by the Tokyo Electric Company whose production cost is said to be about 11 sen per bulb, while the special price to the S. M. R. is 30 sen and the ruling price in Chosen, 40 sen per bulb. The S. M. R. and its allied enterprises consume about 800,000 bulbs per year. The damage to the plant of the Tokyo Electric Company at the time of the earthquake led some of the smaller Japanese companies to submit a proposition to the S. M. R. to take over its plant, enlarge it and enter actively into competition for the supply of bulbs for the China and Korean markets. With the requirements of the S. M. R. as a basis, they argue that a large and profitable industry could be established. It is said that the S. M. R. is willing to consider the proposition and if investigations now being made are favorable the present bulb factory will be enlarged and launched as an independent company.



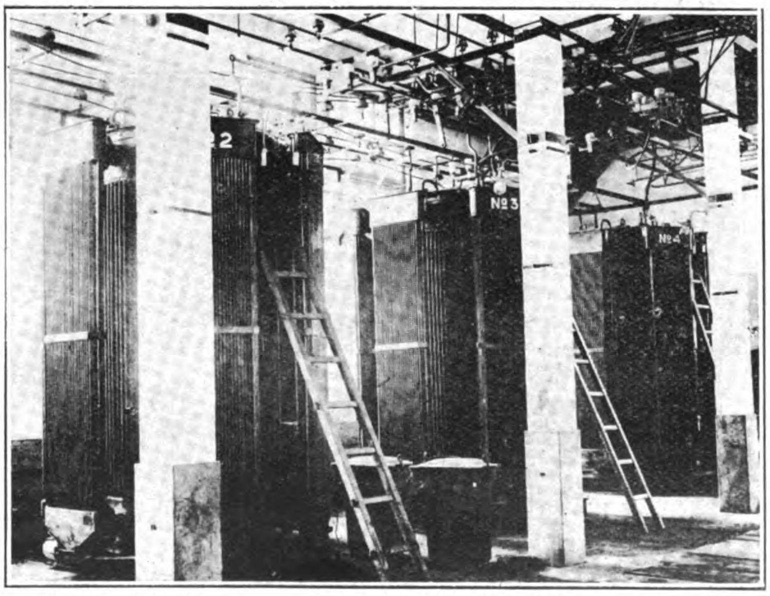
Mukden Sub-Station

Activity of the S.M.R.

The S. M. R. is extremely active in developing its electrical properties. At Newchwang, a



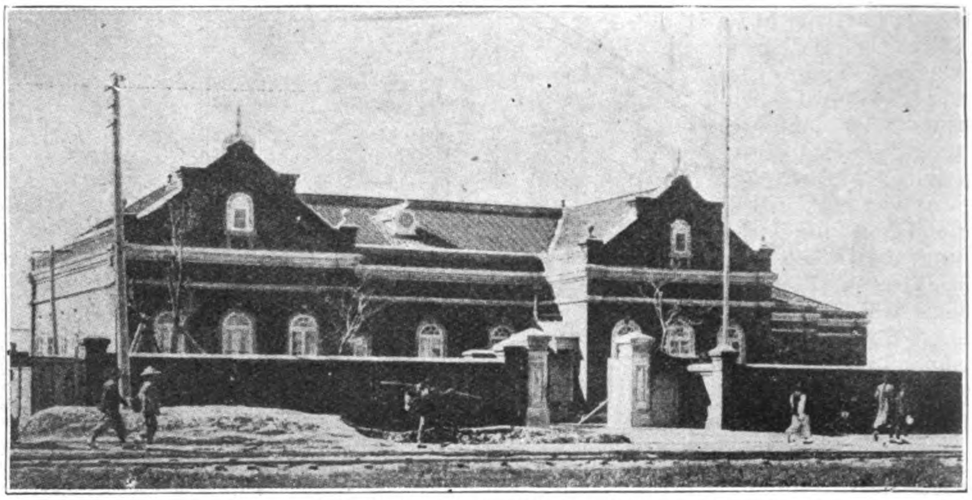
Frequency Changer Room, Nagatomachi Sub-Station, Dairen: 1 set, 2,500 kva, 25-50 cycles, 2,300-11,000 volts



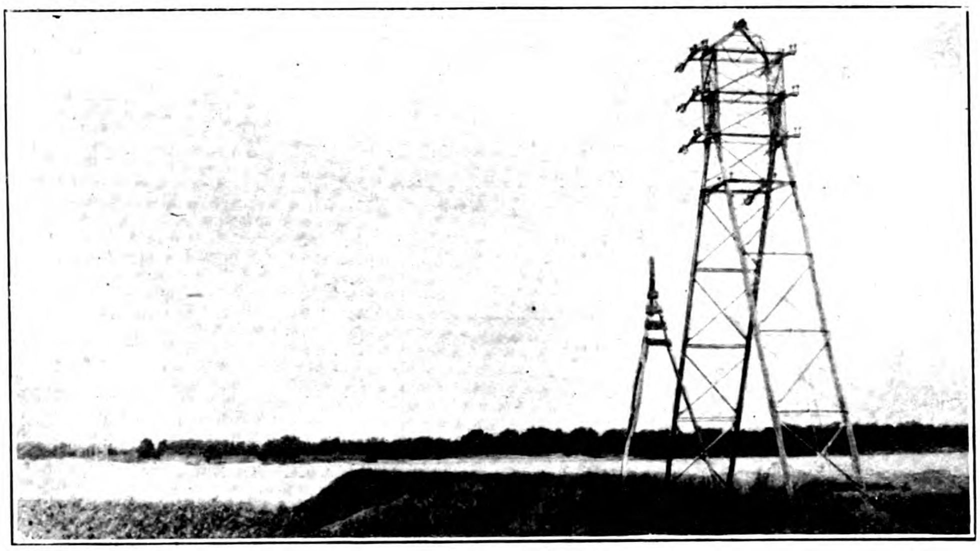
Transformer Room, Nagatomachi Sub-Station, Dairen: 4 sets, 2,000 kva, 11,000 volts

new 1,000 kilowatt set is being added to the plant of the Yinkou Waterworks and Electric Company in order to meet the growing demand for current. Liaoyang is to be supplied from Fushun through a 1,500 k.w. transformer station now nearing completion. Mr. Izuhara, the chief of the electricity department of the S. M. R. says that the power supply will be opened early next May. According to the present plan, 1,000 kilowatts will be used by the new Manchuria Spinning Mill, Ltd., and the remaining 500 for the inhabitants. The supply will be raised ultimately to 3,000 kilowatts.

At Antung, saw milling work is in active progress as an effect of the earthquake in Japan. The power-house can generate 3,000 kilowatts, of which 2,000 kilowatts are being distributed. Paper milling work promises to be revived, in which event the whole of the supply will have to be served.



Power House of the Yinkou Hydro-Electric Company, Newchwang

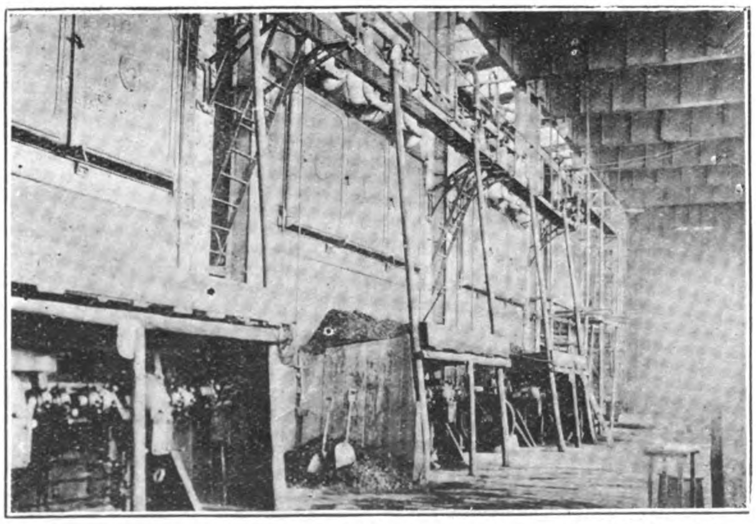


Transmission Line from the Fushun Power House to Mukden: River Crossing

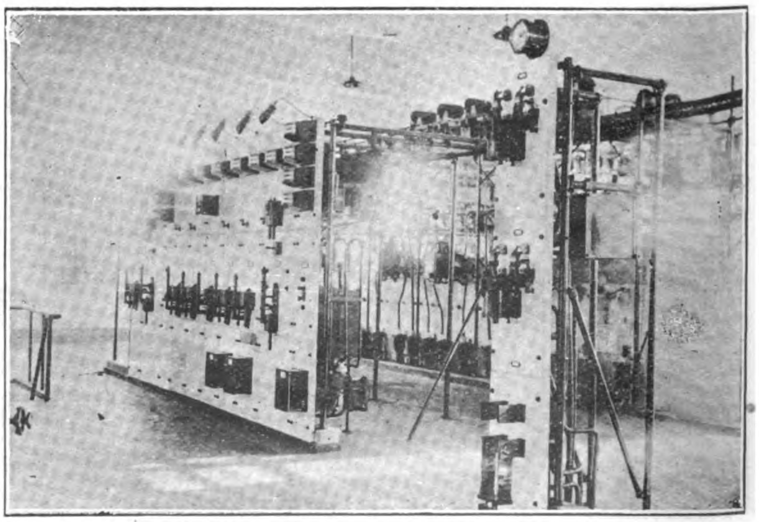
The electricity department of the South Manchuria Railway Company under the directorship of Mr. T. Idzuhara, controls most of the electric light and power business within the railway zone, maintaining plants at Dairen, Mukden, Changchun, Antung, Port Arthur, Newchwang, Liaoyang, Tiehling, Wafangtien, Tashihchiao, Kaiyuan, Kiatow, Ssupingkai and Kungchulin. The capital value of the main properties in the last annual report of the S.M.R. is given as Y.10,303,118.

Dairen.—The principal plant operated by the S.M.R. is the one at Dairen, known as the Hamacho power house. This was originally erected by the Russians at a point near the railway shops and harbor and when taken over by the Company from the Japanese government, was an ill-appointed installation. Public lighting and power for industrial purposes was commenced in October, 1907. As the demand still exceeded the supply, it was decided to increase the power to 3,000 k.w., in the second half of 1908 and the work completed in 1911. As the supply was found still inadequate to meet the demand, another generator of 1,500 k.w. was installed in 1912, and a further addition was made in October, 1917, of three step-up transformers of 350 kilowatts ampere. At the end of March, 1922, the number of electric lights supplied at Dairen was 402,976 (converted to the basis of 10 candle-power), in 23,489 houses, and the electric power was 7,464,587 horse-power. The company also established an electric tramway system in the streets of Dairen to an aggregate length of 13 miles, the larger portion of which was completed and has been in use since August, 1909.

Tramway—The erection of large railway workshops at Shahokou and of a sea-side hotel and bungalows at Hoshigaura (Star Beach), one of the finest sea-side resorts in North China, rendered it necessary to lay a five-mile suburban line, which connects with the city lines. This suburban line was commenced on January 1, 1911, the single return fare for the whole route being 10 sen (2½d.) and 8 sen (2d.) for special and ordinary classes respectively. The terminus of this suburban tramway was shifted to the western fringe of the popular summer resort in 1918, extending it through the whole length of the resort. Another line to Rokotan, a sea-side



Boiler Room: 4 B. & W. Water Tube Boilers Equipped with Westinghouse Stokers



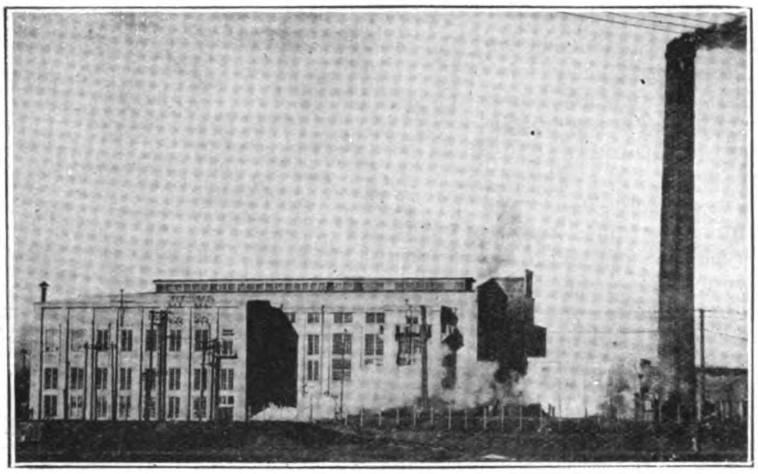
Switchboard: All G. E. type appliances made by the Shibaura Engineering Works

THE AMANOGAWA POWER PLANT AT DAIREN

resort, three miles from the terminus of the city line, was opened for traffic on August 1, 1911. The conveyance of bean and beancake by electric tramway is operated between Hsiaokangtzu (the Chinese quarter) and the wharf, a distance of about 2½ miles. The running mileage at the end of 1921 was increased to altogether over 31 miles, and the numbers of cars now in use are 65 passenger cars, 10 goods cars, and one water sprinkling car.

The remarkable decrease in the amount of outlay of Dairen during the fiscal year 1916 was due to the fact that the electric work shops were transferred to the management of the Shahokou Workshops in July, 1916.

Working year.	Kilowatts generated.	Receipts in yen.	Outlay in yen.
1918	17,098,532	1,423,864	859,821
1919	19,548,810	1,232,095	923,589
1920	19,220,920	1,632,599	1,074,617
1921	22,802,097	1,910,914	1,055,260

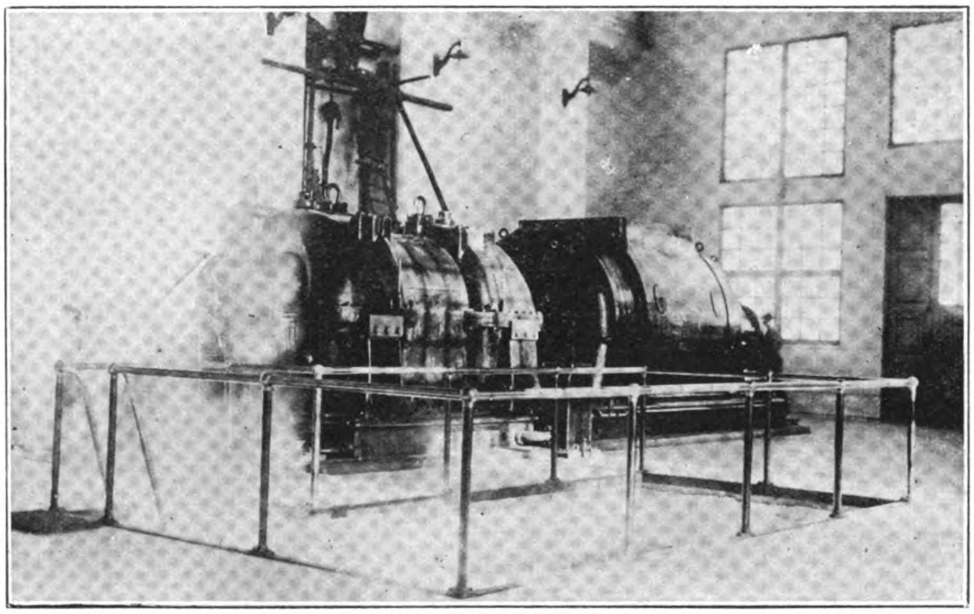


View of Amanogawa Power House, Dairen

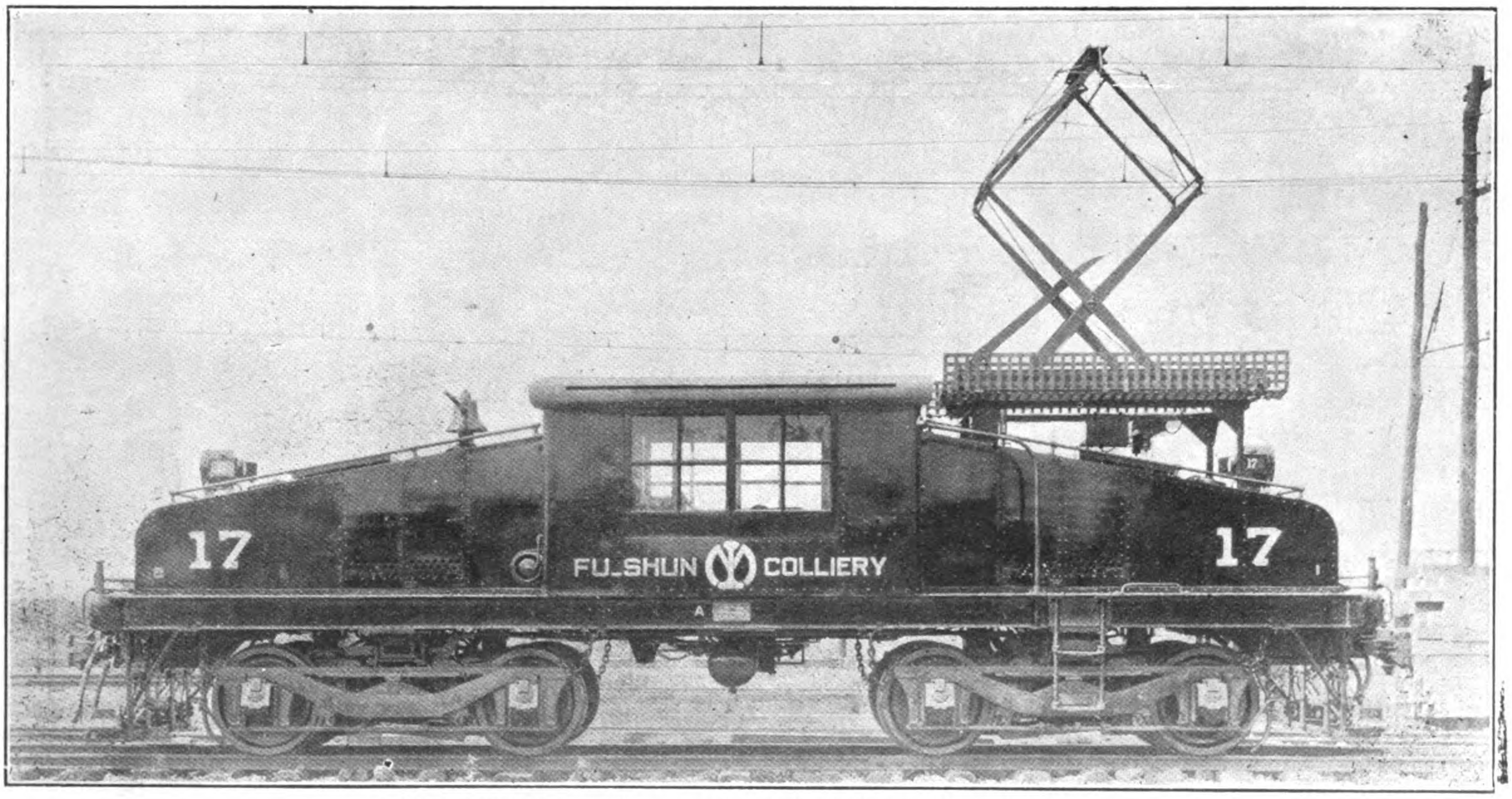
Power Plant Equipment

The Hamacho power plant has a lamp capacity of 550,000, of which 250,000 lamps are in use, at a cost to the consumer of Y.1.20 per 16 candle power lamp. The No. 1 power house has a capacity of 6,000 k.w. and No. 2 of 5,000 k.w. The original Hamacho station (No. 1) supplies 24,033 consumers with 171,594 lights of a total candle power of 7,127,520 and 227 consumers with 7,000 horse-power for 516 motors. The equipment of this plant is as follows :

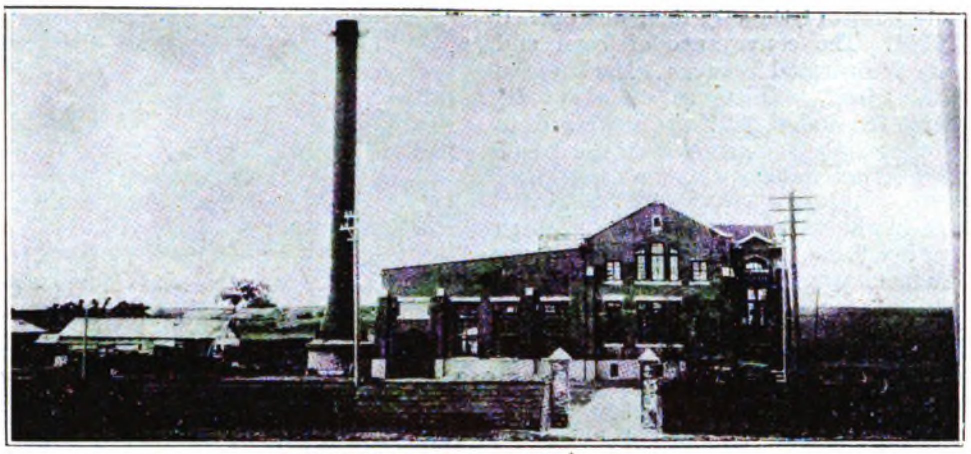
Generators.—A.C., 3 G.E. 1,000 k.v.a. ; 2,300 v. ; 25 cy. ; 125 r.p.m. ; direct connected to McIntosh and Seymour ver. comp. engines ; 1, 1875 k.v.a., 2,300 v. ; 25 cy. ; 1,500 r.p.m. ; G.E., Curtis turbine set; 1, 1,875 k.v.a., 2,300 v., 25 cy., 1,500 r.p.m.; G.E., Curtis geared turbines set. Exciters ; 2, 100 k.w. Mitsubishi ; 1, 75 k.w. G.E. ; 1, 30 k.w. G.E. ; 125 v. ; direct connected. Boilers : all B. & W., 8, 3,530 sq. ft. h.s. ; 1, 5,090 sq. ft. h.s. ; 150-lb. working pressure; Jones underfeed stokers. Blowers, 3 ; pumps, 5 ; open heaters, 1 ; coal saving and crushing appliances.



5,000 K.W. Westinghouse Turbo-Alternator installed in the Amanogawa Power House, Dairen



1,200 volt G.E. Locomotive operating at the Fushun Colliery of the S.M.R.



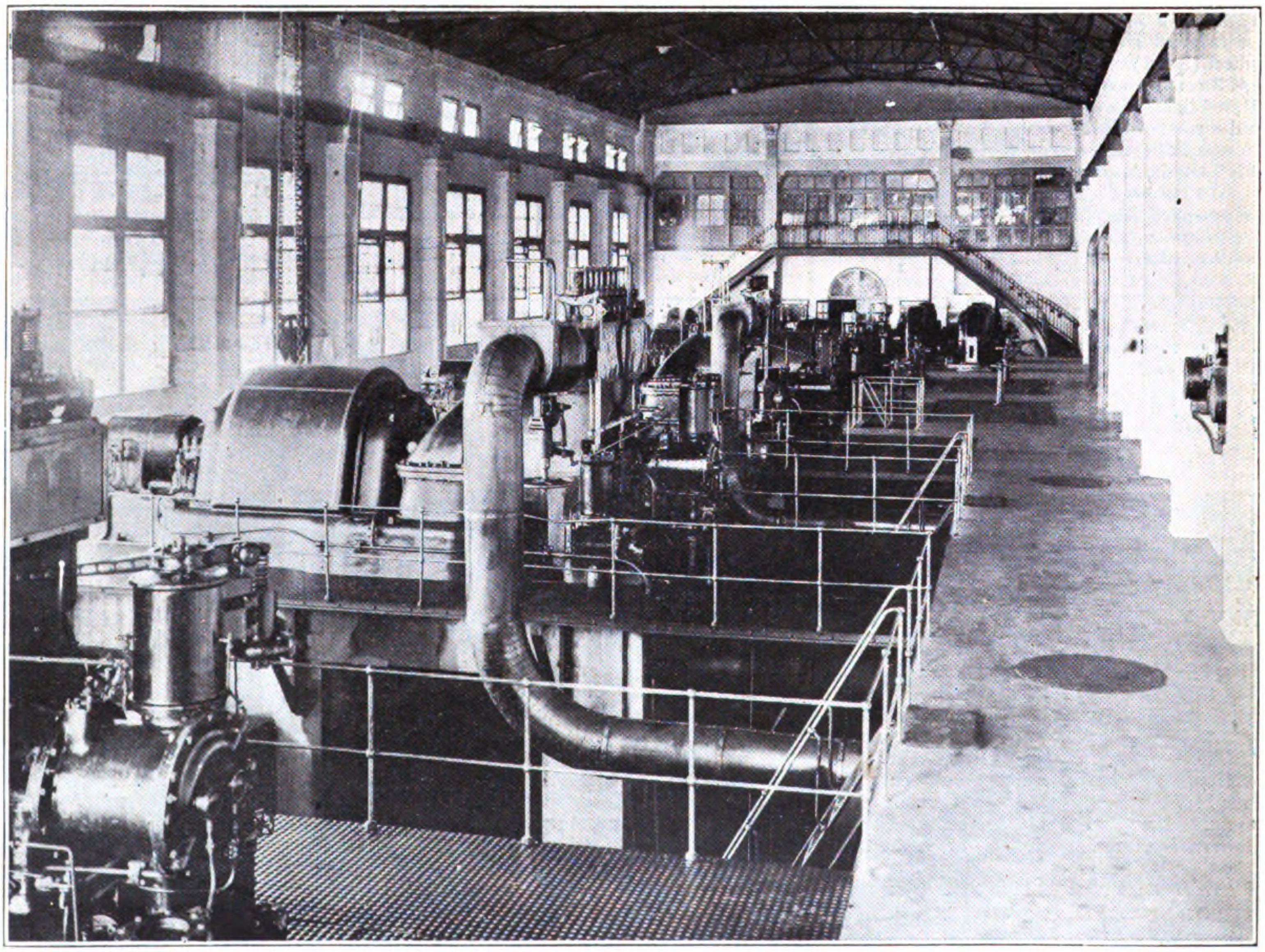
S. M. R. Power House at Changchun

In order to supply the growing needs of the suburban districts, the S.M.R. last year completed a new power house located on the road to Star Beach. This is known as the Amanogawa power house, a model of its kind, in steel and reinforced concrete designed for 30,000 k.w. The present equipment consists *of*: Boilers, 3, 7,135 and 1, 8,283 sq. ft. h.s. with 144 and 168 sq. ft. grate sur. respectively, B. & W. boilers equipped with Westinghouse stokers: 2 vertical Weir boiler feed pumps with enclosed heater; 2 Buffalo forge fans driven by Westinghouse motors for forced draught. 1, Westinghouse turbo alternating set of 6,250 k.v.a. 11,000 v., 50 cy., 3,000 r.p.m., direct connected exciter, 45 k.w., 125 v.; Switchboard equipped throughout with G.E., instruments, switches, transformers, etc., made by the Shibaura Engineering Works.

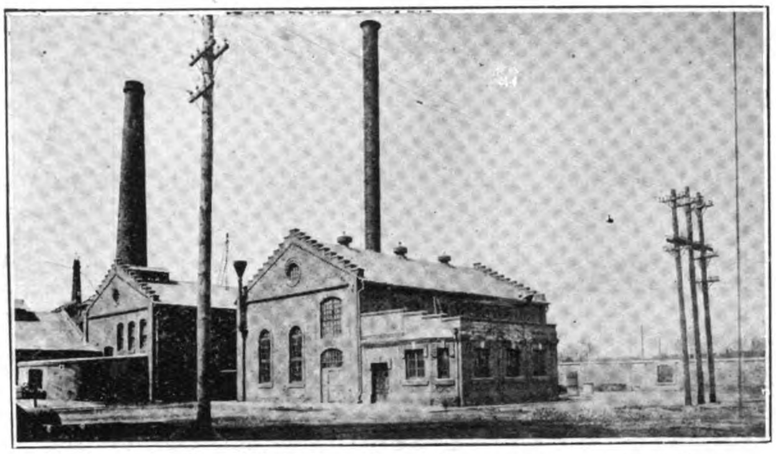
In addition to the three power houses supplying the needs of Dairen, the S.M.R. operates a plant at Shakako a few miles out of the city for the service of the immense railway shops located there. This is an English plant throughout. The equipment consists of 3 batteries of B. & W. boilers with superheaters and chain grate stokers; 5 Green's fuel economizers; steel chimney, 157-ft. high; automatic coal storage and conveyors; 3 Weir ver. feed pumps. 2 Bellis & Morcom compound two-crank, two-cyl., vertical enclosed non-condensing engines 570 b.h.p. direct connected to 2 Dick, Kerr direct current 400 k.w. generators, 250 v. Two motor generators 250 k.w. each, made by the Shibaura Engineering Works, 370 b.h.p., 200 v., 3 ph. 25 cy. induction motors coupled to two 125 k.w. 250 v. dir. cur. dynamos at each end of same shaft, receiving current from the Dairen central station. Switchboard: 23 panels.

Dairen Sub-Stations

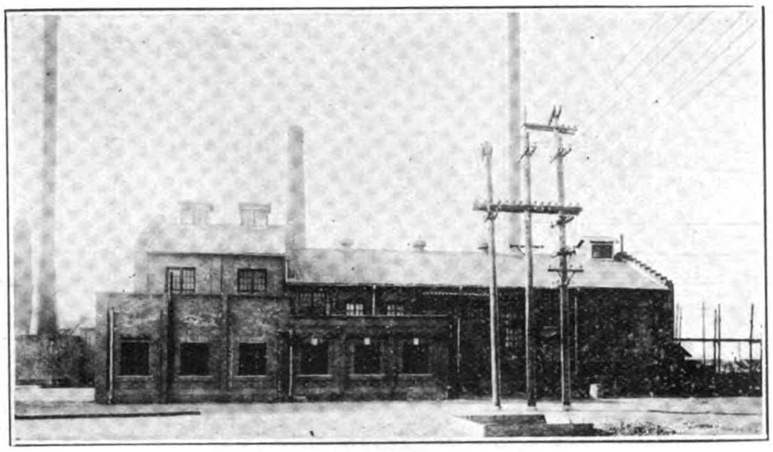
There are five transformer stations in Dairen. At the Hamacho power house there are six 350 k.w. 25 cycles, indoor single-phase oil cooling transformers made at the Shakako works of the S.M.R. with a primary voltage of 2,000 to 2,300 and secondary of 6,000 to 6,600. At Shakako there are also six of the same type which receives the current from the above and transforms it back to the



Electric Generating Room of the Mond Gas Plant at the Fushun Mines of the S.M.R.



As it appeared in 1921, before the addition of the new 1,500 G. E. Turbine Set.

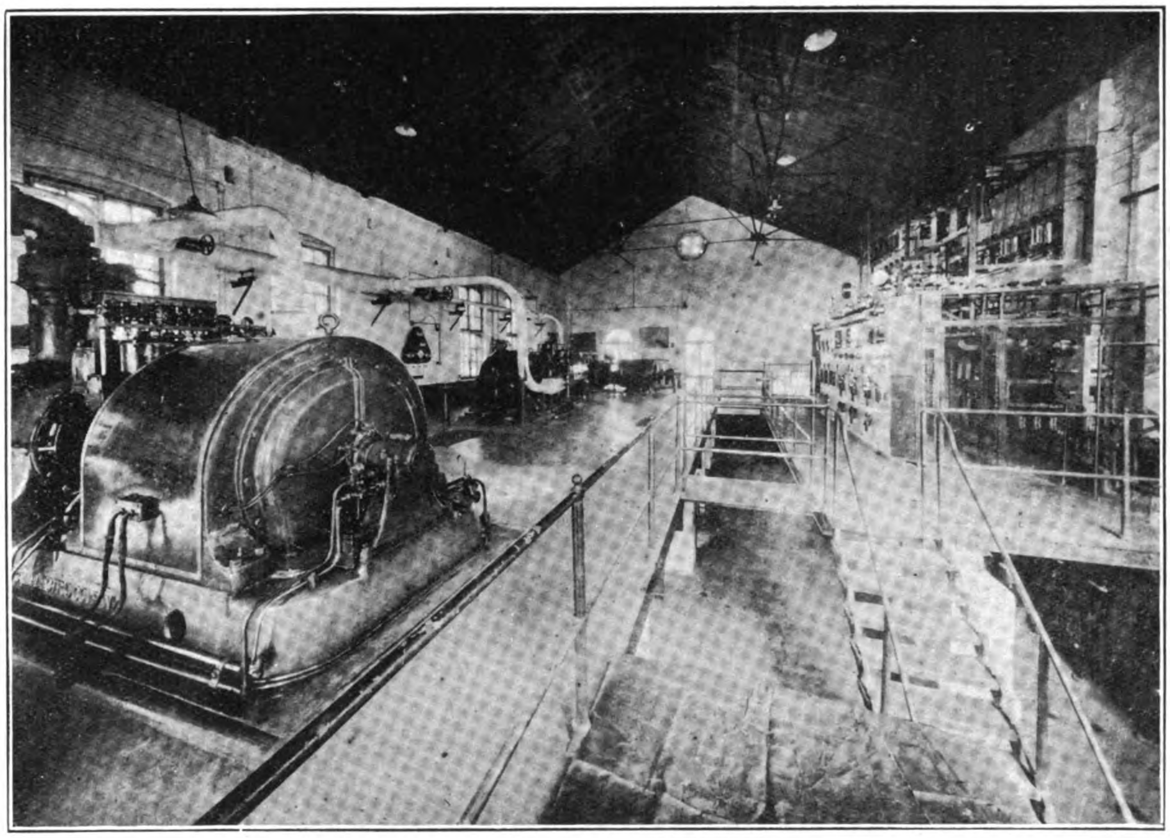


The Extended Plant in 1923.

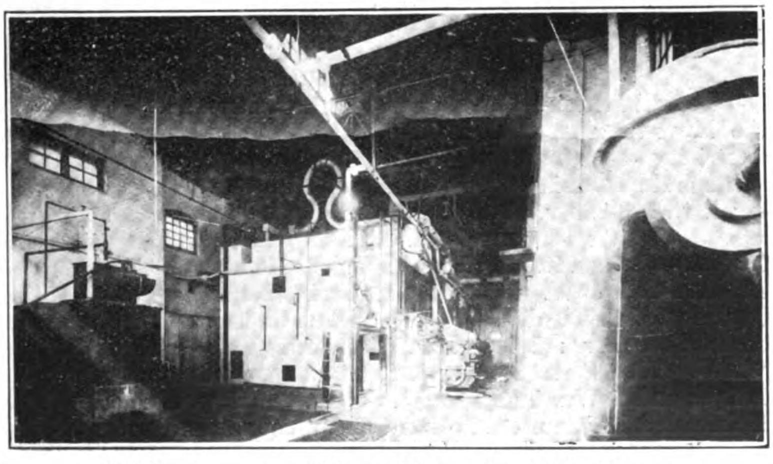
THE CHINESE GOVERNMENT PLANT AT MUKDEN.

primary voltage. At Jinja-ura, in Dairen, there are installed three 1,500 k.w. outdoor transformers made by the Shibaura Engineering Works, receiving a primary voltage of 10,600 and delivering a secondary voltage of 3,300, 50 cycles. The Nagato-cho substation is equipped with four 2,000 k.w. indoor type transformers receiving a primary voltage of 11,000 and transforming to 3,300 volts, 50 cycles. These are also from Japan, manufactured by the Yasukawa Electric Company. The outdoor substation at Daiboshin, has three 100 k.w. Okumura transformers receiving the current at 11,000 and sending it out at 3,300 volts, 50 cycles. There is also the Chusuitzu outdoor station equipped with three 150 outdoor type transformers receiving current at 10,000 to 11,000 volts and transforming to 3,300 volts 50 cycles. This equipment was made at the Kobe works of the Mitsubishi Company. The Hamacho station has also three 400 k.w. rotary converters manufactured by Dick, Kerr & Company converting a 2,300 volt alternating current to 550 volts d.c. The Nagatocho substation has also a Westinghouse frequency converter of 2,000 k.w. capacity and the Jinja-ura sub-station two rotary converters.

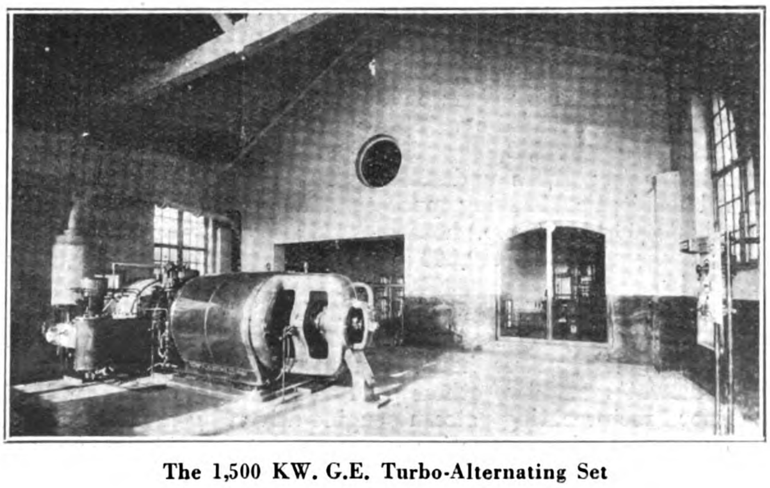
MUKDEN.—The S.M.R. electrical plant at Mukden began to sup-



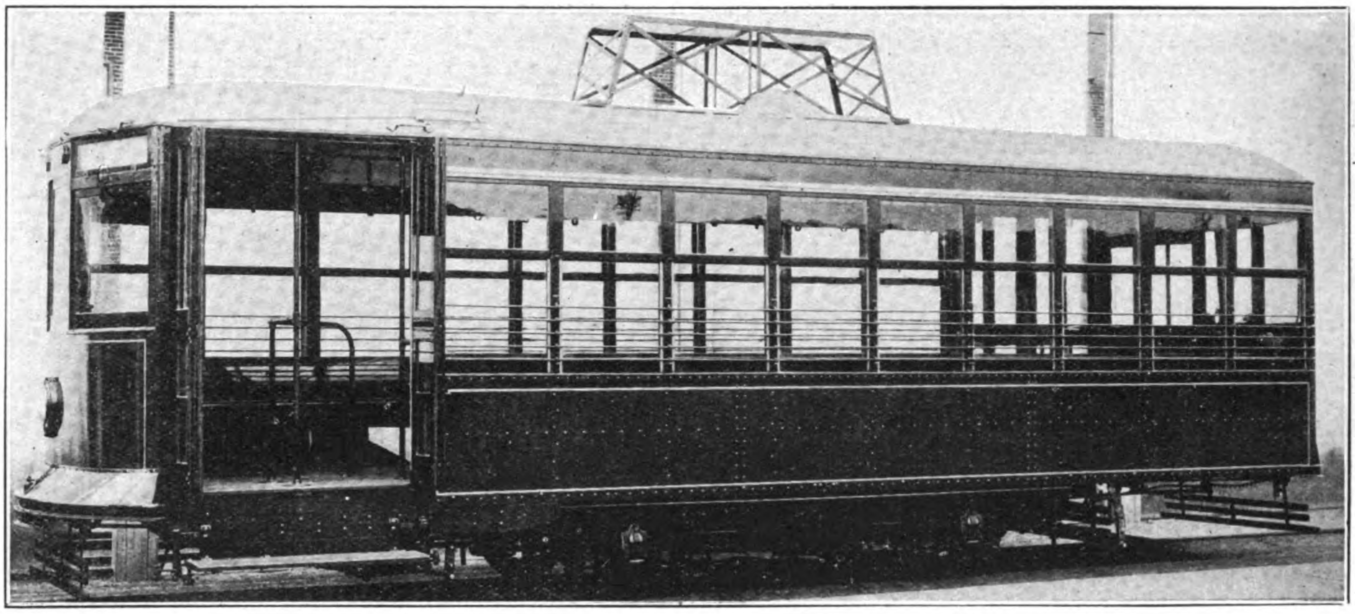
Mukden Government Plant before the 1,500 KW. addition



Mukden Government Power House: The Boiler House



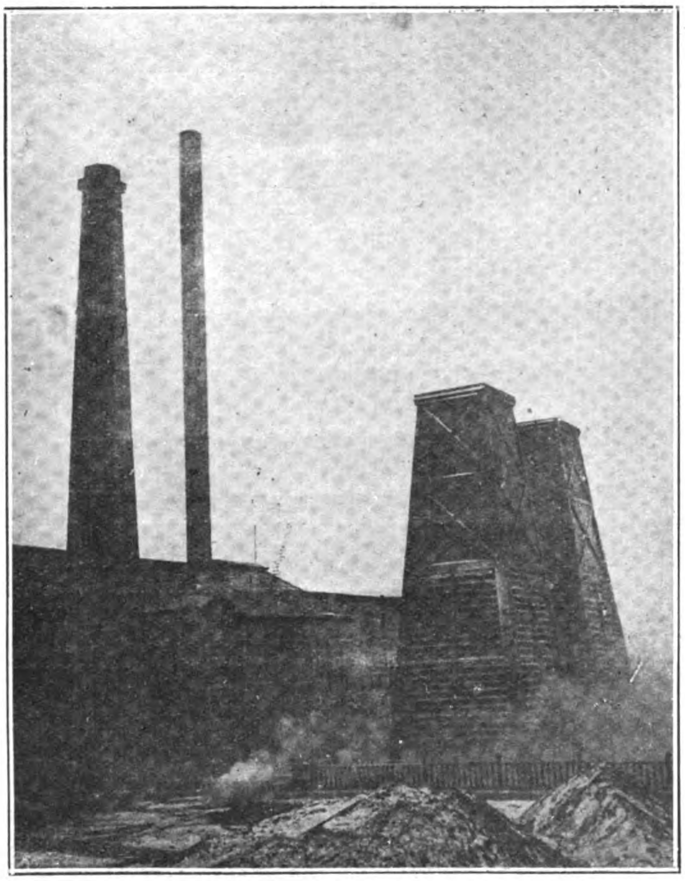
The 1,500 KW. G.E. Turbo-Alternating Set



Birny Safety Tramcar Built by the Brill Company for the Dairen Tramways

ply the railway town adjacent to the station in June 1908. The plant has a capacity of 1,200 k.w. and is equipped with one 200 k.w. British T. H. a.c., generator, direct connected to Bellis & Morcom comp. vertical engine, 3,300 v., 50 cy., 375 r.p.m.; belt driven B.T.H. exciter; 115 k.w., 100 v.; two 500 k.w. generators, 3,300 v.; 50 cy., 375 r.p.m.; made at the Shakako Shops of the S.M. Railway; driven by Bellis & Morcom engines; 1, 18 and 1, 20 k.w., 110 v., d.c. exciters made by Shakako works. Boilers: 2 B. & W. 2,690 sq. ft. h.s. and 1, 5,090 sq. ft. h.s.; 48 and 96 sq. ft. grate; working pres., 140-lb.; Jones underfeed stokers; blowers, 1; pumps, 4; open heater, 1; closed 2; No. of lights (10 c.p.), 1920, 75,946; power, 1,846,-638 h.p. Receipts, 1920, Y.395,317; Expenditures, Y.318,759.

CHANGCHUN.—The Changchun station of the S.M.R. was originally equipped with three generators and steam appliances taken from the old Russian Dairen installation but later on three new 500 k.w. sets were installed. Service was commenced in February 1910. The present plant has a capacity of 3,400 k.w. and is equipped with one 1,400 k.w. Stal turbo-alternator, 3,300 v.; 50 cy., 3,000 r.p.m.; two 250 k.w., B.T.H. a.c. generators, 3,300 v., 42 cy., 158 r.p.m. driven by Ganz engines and three 500 k.w. Shakako generators, 3,300 v., 42 cy., 360 r.p.m. driven by Bellis & Morcom engines. Boilers: 4, 2,690 and 2, 5,090 sq. ft. h.s. B. & W. 150-lb. working pres.; Jones underfeed stokers; 3 blowers; 5 pumps; 1 closed heater; 1 coal-saving apparatus. Report at end March, 1921: No. lights, 66,141 (10 c.p.) houses, 3,375; power supplied, 2,328,408 h.p.; k.w. generated, 4,419,690; Receipts, Y.420,892; Expenditures, Y.370,468.

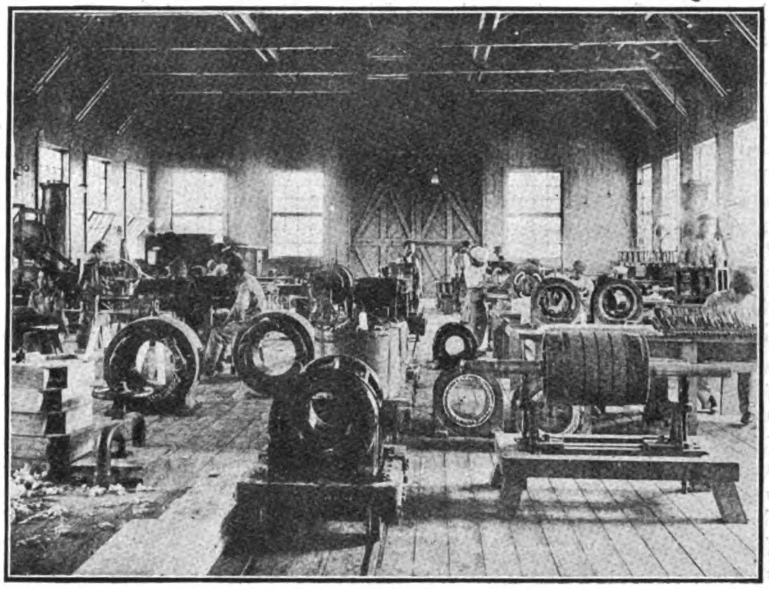


Kirin Electric Light Plant

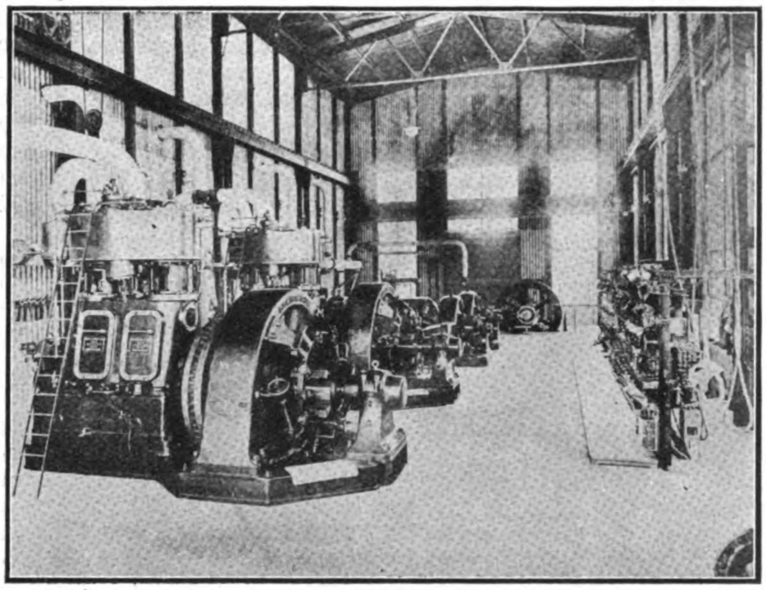
ANTUNG.—On January 1, 1911, the S.M.R. Company took over the works of the Antung Electricity Co. and set about building a new power house equipped with one generator of 100 kilowatts and two others of 100 kilowatts each. In 1917, another reciprocating steam engine-driven generator of 80 kilowatts and also a suction gas generator of 150 horse-power were added, and were put in operation in November of the same year. This still failing to satisfy the demand, a generator of 100 horse-power and a gas generator of 150 horse-power were additionally installed in power house No. 2. Further, the construction of a third power house with 2,000 kilowatts capacity was started in the fiscal year 1918.

The total capacity of the plants is 8,500 k.v.a. The 2nd Antung plant has a capacity of 375 k.w. and is equipped with three A.E.G. a.c. generators, 125 k.w. each, 3,300 v., 50 cy., 187 r.p.m. belt driven by M.A.N. suction gas engines: 1 blower. 3rd Antung plant: Capacity, 8,500 k.w.; two 500 k.w. a.c. Shakako generators, 3,300 v., 50 cy., 375 r.p.m. driven by B. & M. vert. comp. engines: exciters, 2, 16, k.w., 110 v. d.c. Shakako works. Two 3,750 k.w. Westinghouse turbo-alternating sets, 3,300 v., 50 cy., 3,000 r.p.m.; exciters, d.c. 18 k.w., 125 v. Boilers: Two of 7,135 and 1 of 8,283 sq. ft. h.s. B. & W. 150-lb. w.p.; Westinghouse underfeed stokers; 2 blowers; 2 pumps; 1 open heater; 1 coal-saving appliance. Report end of March, 1922: No. of lights (10 c.p.), 78,020 in 6,068 houses; power, 2,179,521 h.p.; k.w. generated, 1921, 6,431,825; Receipts, Y.616,328; Exp. Y.489,258. Profits, 1921-22: G. Y.125,029.14.

PORT ARTHUR.—The electrical plant at Port Arthur is owned by the Kwantung government but is generally supervised by the electricity department of the S.M.R. It supplies about 21,000 lights and has an installed capacity of 1,000 k.w., A.C.; h.t., 2,300 v.; l. t., 100-220 v.; 3-phase, 3-wire, 60 cycles; power factor, 0.8. It is equipped with 2 B. & W. boilers 6,182 sq. ft. h.s. each, and 2 Heine, 2,870 sq. ft. h.s. each; chain grate stokers; working pressure, 180-lb. for B. & W. and 130-lb. for Heine boilers; B. & W. boilers superheated 1,700 deg. F. The fuel used is Fushun bituminous coal. *Generators*: 1,500 k.w. Shibaura generator, driven by W. H. Allen Sons Co. vertical, trip. exp. condensing engine 750 b.h.p.; and 2 Westinghouse generators, 250 k.w. each, driven by McIntosh & Seymour Co. horizontal, compound condensing engines, 400 b.h.p. each. Vacuum, 26-in. for normal working. Working pressure, 170-lb. for 730 b.h.p. engine and 120-lb. for 400 b.h.p. engines.



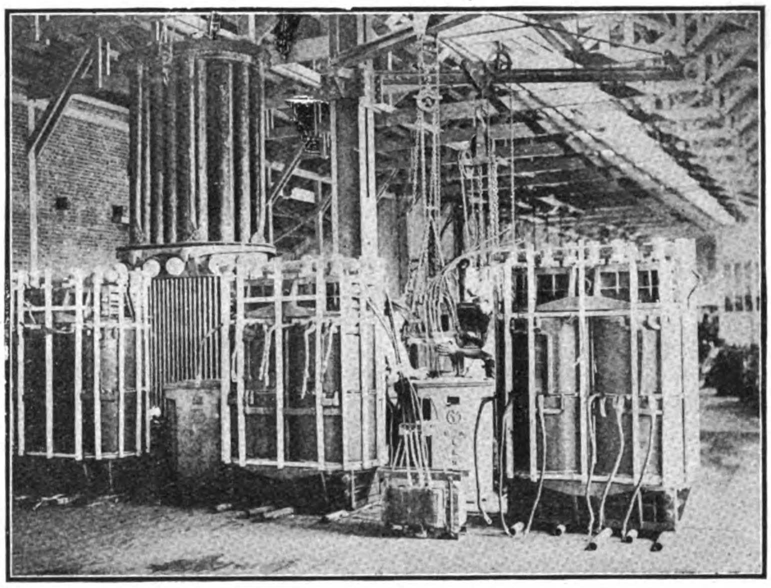
Motor Winding Room.



Power House.

ELECTRICAL SHOP IN THE SHAKAKO WORKS OF THE S.M.R. NEAR DAIREN.

NEWCHWANG.—The Newchwang plant, having a capacity of 850 k.v.a., is operated by a private company called the Yinkou Waterworks and Electric Company, Ltd., organized under Japanese laws with a capital of Y.2,000,000 of which 500,000 is paid up. The S.M.R. controls a large part of the shares and supervises its operation. The equipment is as follows: One 300 Bruce Peebles, a.c. generator 3,500 v., 50 cy., 375 r.p.m. Bellis & Morcom v.c. engine; one 200 k.w. A.E.G. a.c. generator, 3,300 v., 50 cy., 430 r.p.m. driven by an Allen engine and one 350 k.w. A.E.G. 3,300 v. 50 cy., 375 r.p.m., driven by a B. and M. v.c. engine. Boilers: 3 B. & W., 3.14 sq. ft. h.s.; 140-lb. w.p.; Jones stokers; 2 blowers; 4 pumps; 1 open heater (1921); No. of lamps (10 c.p.), 33,256; total c.p. As previously noted a new 1,000 k.w. set is being installed.



Assembling Transformers at the Shakako Works.

TIEHLING.—The Tiehling plant also operated by the S.M.R. has a capacity of 450 k.v.a., and is equipped with one 200 k.w. B.T.H. a.c. generator, 3,300 v., 50 cy., 375 r.p.m. ver. comp. engine; one 250 k.w. G.E. generator, 200 r.p.m. horizontal comp. engine, McIntosh & Seymour. Boilers, 2, 700, 1, 800 and 1, 1,040 sq. ft. h.s., Takuma and 1, B. & W. 2,690 sq. ft. h.s. with Jones stokers. I blower; 4 pumps; 1 open and 1 close heater; No. of lamps, 1921, 8,552; 177,950 c.p.; 1,115 consumers. No power is sold.

TASHIHCHIAO.—The S.M.R. Tashihchiao plant is equipped with one G.E. d.c. generator, 59 k.w., 220 v., 310 r.p.m., driven by a vert. comp. marine engine; boilers: 1, 900 sq., ft. h.s. Lancashire and 1, 600 sq. ft. h.s. Takuma boiler, 120-lb. w.p.; 2 pumps; No. of lamps, 1921, 3,045; 59,620 c.p.; 723 houses. No power sold.

KUNGCHULING.—The plant at Kungchuling was opened in March 1917 by the S.M.R. Company, having a capacity of 150 k.w. It is equipped with one Okumura a.c. generator, 3,300 volts, 50 cy. 500 r.p.m., belt driven by a hor. comp. engine and one same make and capacity direct drive, by a vert. comp. marine engine; exciters, Okumura. Boilers: 1 Lancashire, 850 and 1 Takuma, 840 sq. ft. h.s. 120-lb. w.p.; 3 pumps; 1 closed heater; 1921, No. of lights, 7,489; 117,500 c.p.; 1,212 houses; 2 motors, 175 h.p.; 1 consumer.

LIAOYANG.—At Liaoyang, the plant is operated by a Sino-Japanese Company in which the S.M.R., representing the Japanese interests, took one-half the share capital of Y.1,200,000, the other half distributed between the Chinese merchant guilds and the Chinese town council. The company has been successful, paying dividends of ten per cent. for 1921-22. The plant of 316 k.v.a. has a lamp capacity of 24,000 16 c.p. lamps, of which 13,000 are in use. The equipment of the plant is two Dick-Kerr 100 k.w. sets, 3,300 v., 50 cy., 375 r.p.m.; one Mather and Platt generator, 116 k.w., 3,000 v., 60 cy. 450 r.p.m., driven by a vertical compound Allen engine. There are three B. & W. boilers, 870 sq. ft. h.s. 145-lb. w.p.; one Lancashire, 735 sq. ft. h.s.; 90-lb. w.p.; 3 pumps; 1 open heater. Fuel, coal; 4,888 tons used in 1922.

The demand for power created by the erection of the new Manchurian Cotton Mill at this place is being supplied from the plant at Fushun.

FUSHUN COLLIERIES.—In the operation of the great Fushun collieries the S.M.R. Company has shown its progressiveness by employing the most modern and efficient methods of production. A very poorly equipped electrical plant found on the property when taken over from the Russians has been extended in accordance with the ever increasing needs of the colliery and town to a capacity of 31,500 k.w. There are now three electric power houses at the mines, one of which is kept as a reserve. The No. 1 plant (reserve) is equipped with two 1,000 k.w. C. A. Parsons turbo-alternating sets and No. 2 with two 1,500 k.w. A.E.G. and three 3,000 k.w. G.E. Curtis turbo-alternating sets, connected with eleven Mond gas plants consuming 240 tons of coal per day, and fourteen Lym gas producers. The gas is burned under the boilers after recovering the bye-products of coal tar and sulphate of ammonia.

The third plant is an innovation in applied engineering, as here the S.M.R. has erected the first pulverized coal installation in China. This plant with a capacity of 17,500 k.w. is equipped with one 5,000 k.w. and one 12,500 k.w. G.E. Curtis turbo-alternators. A Holbeck pulverized coal installation permits the use of sweepings, dust and inferior grades of coal for which no market is available. There are three Bonot's pulverizers reducing coal to particles of about 1-10,000 of an inch, having a capacity of 5 tons per hour. The reinforced concrete chimney attached to this plant is 260 feet high and 14 feet in diameter.

In addition to the generation of light and power for the mines and the adjacent towns the above plants furnish current for the operation of an electric railway which transports the coal from the pits to the main line of the S.M.R. at Mukden. This line is equipped with three G.E. electric locomotives moved by four 100 h.p. motors each. There is also a 25-ton shunting electric loco at the pits equipped with two 55 h.p. motors. The line has an automatic block signal system supplied by the Union Switch and Signal Company.

Three thousand kilowatts are transmitted from the mines to Mukden and Liaoyang for lighting and industrial purposes. This is to be increased this year to 9,000 k.w.

Other Small Plants

Other small plants operated by the S.M.R. are located at Szupingkai, Kaiyuan, Kiaotow and Wafangtien. With the exception of the one at Kiaotow these are Sino-Japanese enterprises in which the S.M.R. represents the latter interests. The plant at Szupingkai was established in 1917 with a capital of Y.60,000. It has a capacity of 135 k.w. and equipped with one 60 k.w. Mitsubishi direct current generator, 220 v., 500 r.p.m., driven by a vertical compound engine and one 75 k.w. Shakako d.c. generator, 220 v., 310 r.p.m. driven by a marine vert. comp. eng., boilers, 3 Takuma type 460 sq. ft. h.s. and one B. & W. 2,010 sq. ft. h.s. 120-lb. w.p. 2 pumps; 1 open heater; No. of lights, 1921, 5,568; 110,700 c.p.; 871 houses; no power sold.

The plant at Kaiyuan was established in 1912 with a capital of Y.500,000 of which Y.237,500 is paid up. The generator is operated by a gas engine connected to its own producer. There are 11,000 lamps in use. The Kiaotow steam plant is a small affair with a lamp capacity of 2,000, of which only 1,000 are in use. The Wafangtien plant was established in 1914 with a capital of Y.50,000. It has one 75 k.w. G.E. generator driven by a marine type vertical compound engine. In 1921, 2,912 lamps were in use. This completes the electrical activities of the S.M.R. in South Manchuria.

Penchihu Plant.—At the works of the Penchihu Coal and Iron Works located at Penchihu on the Antung-Mukden division of the S.M.R. is an electrical plant for the service of the iron works, mines and town. This company is a Sino-Japanese enterprise under the management of Okura & Company. The plant has a capacity of 5,500 k.w. alternating current and is equipped with one G.E. 2,500 k.w. and two A.E.G. 1,500 k.w. turbo-alternating sets.

Harbin.—At Harbin, in the old Russian zone, a Japanese concern registered as the North Manchuria Electric Power Company took over in 1918 the two Russian electricity works known as the Michikof and the Energia. This company, registered under Japanese law, has a capital of Y.1,200,000 and although it encountered many difficulties at the outset, is now on a solid basis and building a new power house to meet the increasing requirements of Harbin.

There are three electrical companies in Harbin. The plant of the Yueh Ping Electric Light Company, capitalized at $1,500,000 ($1,250,000 paid up), is located in the Chinese city of Fuchiatien across the Sungari river from the Russian town. Although of small capacity, only 1,200 k.w., it is most efficiently operated and maintained, furnishing 50,000 lights for house and street illumination. The equipment, supplied through Messrs. Andersen, Meyer & Company, is American throughout. There are two 600 k.w. G.E. Curtis turbo-alternators, three Stirling boilers fitted with B. & W. superheaters and Murphy stokers, two Worthington surface condensers, Cochrane feed water heater, etc.

The third undertaking is called the Harbin Electric Supply Company organized to supply light and power and operate a tramway system in that city. The company has passed through a series of financial difficulties and law-suits but we understand that the American contractors are on the ground and carrying out the construction of the tramway.

Mukden and Kirin.—The largest Chinese-owned plants in the three eastern provinces are located at the provincial capitals of Mukden and Kirin. Both are equipped throughout with American machinery supplied through the firm of Andersen, Meyer & Company. The Mukden plant has an installed capacity of 5,300 k.w. The generators consist of one 2,500 k.w., one 1,500 k.w., one 500 k.w., one 350 k.w. and one 160 k.w. all G.E. Curtis turbo-alternating sets. The boilers are of the B. & W. type with Worthington condensers circulating and hot-well pumps with an Edwards air-pump. In addition, there is a Diamond soot blower, Buffalo forge air washer and cooling pond equipment. The plant is operated by the provincial government which controls the largest part of the share capital of $1,200,000. An American engineer, Mr. J. E. Popper, is in charge. International politics plays a conspicuous part in the operation and equipment of the Mukden plant and in considering new extensions the engineers have to keep always in mind the reluctance of the Chinese to favor Japanese products. The logical source of fuel for the Mukden plant is the near-by mines at Fushun, but these are Japanese owned, while the officials who run the government and control the plant are all more or less interested in coal mines located in Kaiping district, over two hundred miles away and tributary to the Peking-Mukden line of the Chinese government. In 1921, when the question of adding the 1,500 k.w. extension was under consideration it was proposed to erect the new plant at Fushun, tramsmitting the current at 50,000 volts to Mukden. Coal at Fushun can be purchased at $3,00 per ton against a cost of $10 in Mukden. The other proposition was to increase the boiler pressure to 250-lb. instead of 150 and superheat to 200° instead of 120° and locate the plant near the railway in order to get coal direct into the boiler room instead of carting it five miles through the heart of the city at a cost of $1.50 per ton. Both of these propositions were rejected and the new extension built on to the old plant. Since then, the engineer of the plant has been ordered to supply 1,000 horse-power to Chang Tso-lin's new Mukden arsenal. A further extension of 2,500 k.w. will soon be in operation. This is to be a G.E. Curtis turbo-set, with five feeder panels of 150 amperes capacity each, one 25-ton hand crane, two water-tube boilers of 6,182 sq. ft. h.s. each, one guyed steel stack 150 feet high and 8 feet diameter, one open type feed water heater and two pumps. This will bring the total capacity of the plant up to 5,300 k.w. with 2,485 boiler horse-power. This year an induced draft equipment will be installed for the two new 6,182 sq. ft. h.s. boilers. The first turbo set was ordered in 1909. It is a standard G.E. 500 k.w. set rated down to 350. In 1914, a 500 and a 160 k.w. set was ordered. All these sets have been in continuous operation since their installation without any repairs.

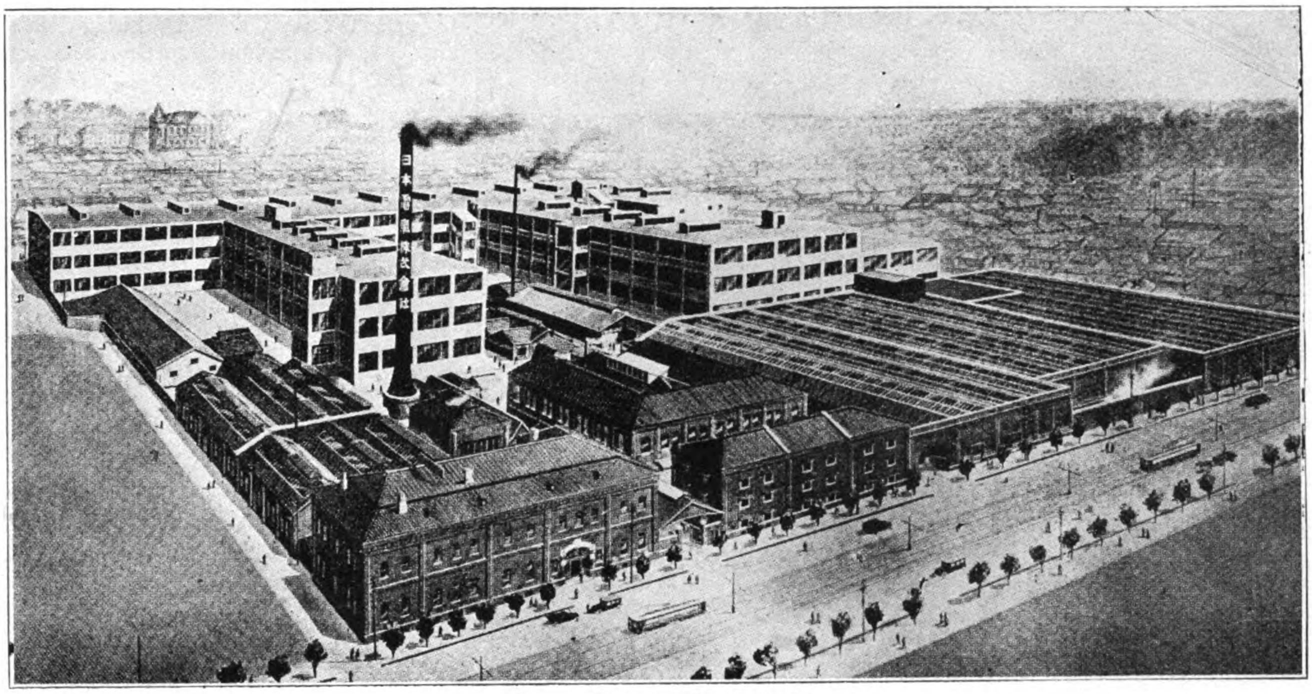
The 1,000 k.w. plant at Kirin is owned by a Chinese registered company having a capital of $1,000,000. It is equipped with two 500 k.w. G.E. Curtis turbo-alternating sets, stirling boilers with superheaters, Murphy stokers, Worthington pumps, etc. New equipment purchased in America was installed in and placed in operation during 1923.

Leased Territory.—In addition to the above plants there are a number of smaller installations scattered throughout the Manchurian provinces. In the Kwantung leased territory are found a small gas engine plant at Pitzewo owned by Japanese with a capacity of 2,000 lamps, and at Pulantien there is another small Japanese-owned plant with a lamp capacity of 3,000, of which only about half are in use. The machinery for these two small installations was made in Japan.

Chinese-Owned Plants, Fengtien.—In the province of Fengtien in Chinese territory, there are a number of small Chinese-owned plants supplying the needs of their respective localities. At Chinchow, there is a 200 k.w. G.E. Curtis turbo set, with Worthington surface condenser and B. & W. boilers erected by Andersen, Meyer & Company. The company has a capital of $300,000 and supplies current for 8,000 lamps. At Fukiatun is found a small 4,000 lamp steam generating set and at Liaoyuan a 300 k.w. plant owned by a company capitalized at $200,000 which furnishes 5,000 lights. The Ming Sing Electric Light Company at Kaiping, has a little 60 k.w. G.E. generator belt driven by an Ames engine deriving steam generated in an Ames horizontal return tubular boiler. At Changtu, is a 3,000 lamp plant operated by steam and at Sian a company organized with $120,000 began service in 1922. The Sifeng plant, with a 3,000 lamp capacity, is another 60 k.w. G.E. generator direct connected to a Reader vertical compound engine furnishing 1,600 lights to the public. At Tungliaochen, is a 200 k.w. G.E. Curtis set with two Stirling boilers, superheaters, Worthington pumps and condenser, Harrison heaters, etc. This plant, together with those at Chinchow, Kaiping, and Sifeng were supplied through Andersen, Meyer & Company.

Another 1,000 k.w. G.E. turbo-alternating plant furnished by the same firm is installed in the Mukden cotton mill. Here also are found Stirling boilers, Murphy stokers, Worthington condenser

(Continued on page 102)



Nippon Electric Works, 1922

Twenty-five Years of Successful Co-operation in Japan

A Quarter Century Completed by the Nippon Electric Company, Limited

By D. F. G. Eliot, Comptroller, Nippon Electric Company

(Lacking only one month of the completion of a quarter century of uniformly successful operation, and with a happy personnel busily engaged on plans for a celebration on its twenty-fifth anniversary, the Nippon Electric Company on September 1, 1923 *was one of the many victims of the recent earthquake disaster, resulting in the loss of one of its American representatives, a number of its Japanese employees and the destruction of a number of its modern buildings. Although but meagre reports have so far been received, plans are already in process for the creation of an even greater plant than that destroyed. In the following article, which was received just prior to the disaster, the remarkable progress of the Company is outlined. Its success has resulted from the able management of its Japanese directors, the efficient work of its employees, and the splendid co-operation between the Japanese and American interests ; the Company may therefore look to the future with full assurance for continued progress and success.*—EDITOR.)

Mr. K. IWADARE,
Managing Director, Nippon Electric Company.

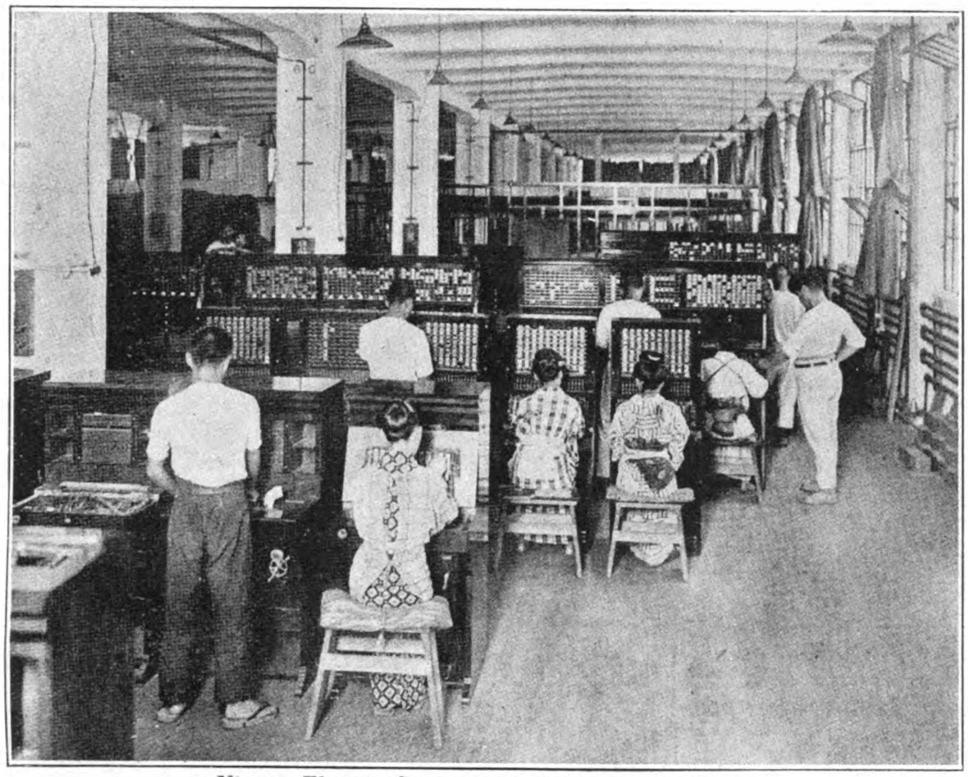
OCTOBER 1, 1898 to October 1, 1923 ; twenty-five years of phenomenal growth and success have come to a close; twenty-five years of successful co-operation between American and Japanese interests have been completed, and the Nippon Electric Company, Limited, the affiliated company in Japan of the International Western Electric Company, Incorporated, with its first managing director, Mr. K. Iwadare, still active in the affairs of the Company, is ready for next step in the journey towards further prosperity and success in the development of the telephone industry in Japan.

History of the Development of the Telephone in Japan

The introduction of the telephone into the empire dates back to the year 1877, when a Japanese brought back from America a magneto telephone. The interest created by this new and wonderful machine gradually made itself felt; the first practical use of the telephone, so far as we have been able to discover, being made a few years later by the police department in Osaka, where circuits were constructed as long as thirty miles, and as many as ten instruments were connected in series on a single iron wire circuit.

Encouraged by the success of this installation, a private company was formed in 1883 to exploit the telephone. It accomplished but little, however, and it was not until 1889, when the government decided to take over the telephone business as a government monopoly, that the development of the art began to make appreciable progress.

The occurrences leading up to this important step on the part of the national government take us back a year, to 1888. During that year Dr. S. Oi was sent abroad by his government to study telephone and telegraph development. During the same year, Mr. K. Sawai was sent on a similar mission by the promoters of the private company. Mr. Sawai and Dr. Oi met in London and exchanged views on their observations and experiences. While they were together in London they received news from Japan that telephones and telegraphs were to be developed as a government monopoly. On the return trip to Japan, Mr. Sawai was unfortunately taken ill and Dr.



Nippon Electric Company: Switchboard Assembly

between Tokyo and Atami, a distance of about sixty-five miles, and in the following year between Tokyo and Shizuoka, the great tea centre, distant about 120 miles, using No. 12 S W G bare copper wire. In 1890, Tokyo and Yokohama, distant eighteen miles, and in 1899, Tokyo and Osaka, about 350 miles apart, were connected, and the lines opened to the public. Other important cities were connected as the development progressed.

The first use of telephone cable came in 1897, when 25- and 50-pair aerial cable of the "Patterson" type and 100-pair underground cable, supplied by the Western Electric Company's Hawthorne factory, were installed in Tokyo for local subscribers' lines. Two years later, in 1899, 200-pair cable was installed in Tokyo and Osaka.

The first long-distance telephone cables were laid in 1922, between Tokyo and Yokohama, and between Kobe and Osaka, each cable being approximately twenty miles long.* Development of long-distance communication through cable is now being actively taken up by the government, and plans are under way for the installation of a loaded toll cable, containing 184 pairs of wires, to connect Tokyo and Osaka, the first two sections, comprising about sixty miles of cable, having already been manufactured and delivered to the government.

Thus for thirty years or more, the Nippon Electric Company has been the pioneer in assisting the government of Japan in the latest developments known to the telephone art.

In addition to standard telephone equipment and cable, Western Electric printing telegraph equipment is now in use by the government telegraph department, and Western Electric train despatching equipment is extensively used by the government railways.

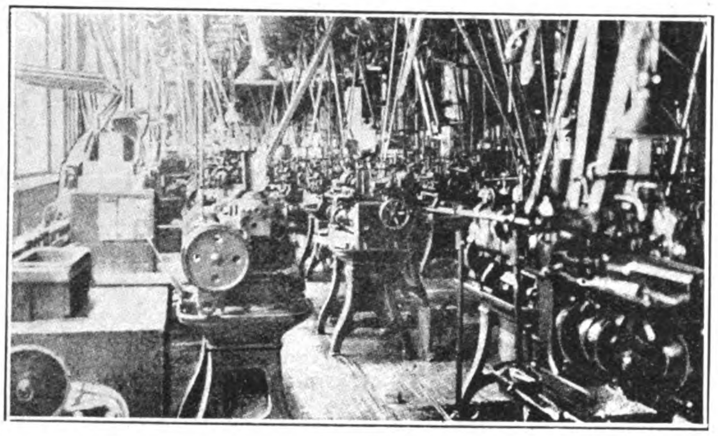
*For description see Electrical Communication, February, 1923.

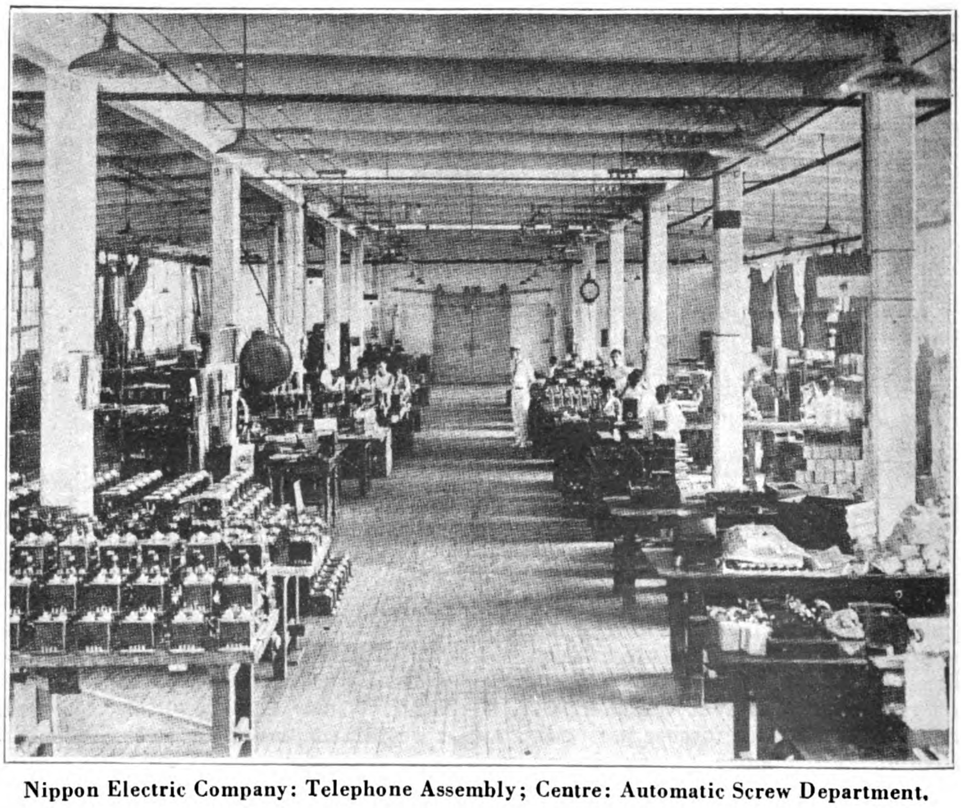
Oi was forced to carry the entire burden of the development of telephony for his government. He was subsequently placed in charge of the first telephone exchange in Japan, later became the first chief engineer of telegraphs and telephones, and is now a director of the Nippon Electric Company, Limited.

In the course of his travels through Europe and America Dr. Oi made the acquaintance of, and was greatly assisted by, Mr. H. B. Thayer, at that time manager of the Western Electric Company, New York, and now president of the American Telephone and Telegraph Company; Mr. J. J. Carty of the American Telephone and Telegraph Company; and Mr. F. R. Wells, manager for the Western Electric Company in Europe. From this visit dates the first connection of the Western Electric Company with Japanese telephone development.

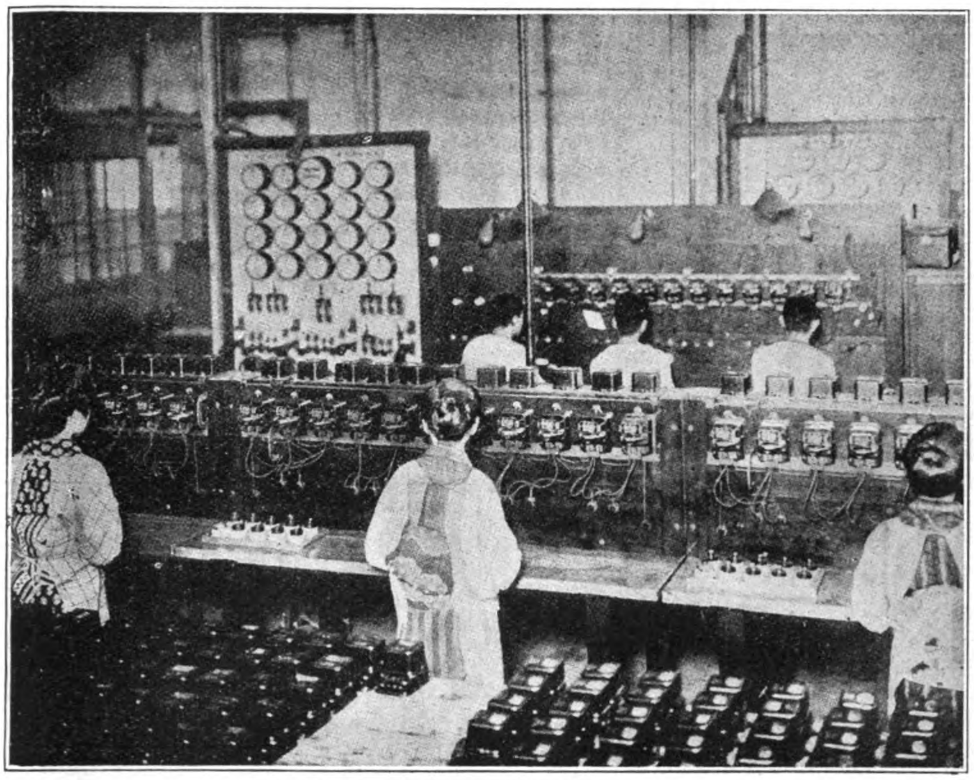
Dr. Oi, on his return to Japan in 1889, brought with him the first Western Electric switchboard equipment used in Japan, a 100-line standard board, and three 240-line series multiple boards. With this equipment public telephone service was started. The Japanese, holding the same doubts as their American friends had held a few years previous, were inclined to look askance at this talking machine, and subscribers were not readily obtained. Statistics show that when telephone service was started in 1890, there were but 200 subscribers in Tokyo and forty in Yokohama. With this modest beginning, the telephone started to take hold; in 1895 there were nearly 3,000 subscribers' stations; in 1910, over 100,000, while to-day, in Japan and its possessions, there are 416,000 subscribers' stations, not including telephones connected through private exchanges.

The development of long-distance communication through open wire lines was carried on simultaneously with the development of local traffic. In 1888, experimental lines were installed





Nippon Electric Company: Telephone Assembly; Centre: Automatic Screw Department.



Nippon Electric Company: Watthourmeter Testing

On July 1, 1899, after the laws of Japan had been changed to permit of the investment of foreign capital in Japanese companies, the Nippon Denki Kabushiki Kaisha was formed with a capital stock of Y.200,000, fully paid. The promoters of the Company were Messrs. Kunihiko Iwadare, Takeshiro Mayeda, Rokuichiro Masujima, Yasusaburo Fukushima, Koreteru Fujii, Walter T. Carleton and Ernest W. Clement.

At the first meeting of the board of directors of the newly formed Company, Mr. Iwadare was elected managing director, in which position he has served for twenty-five years.

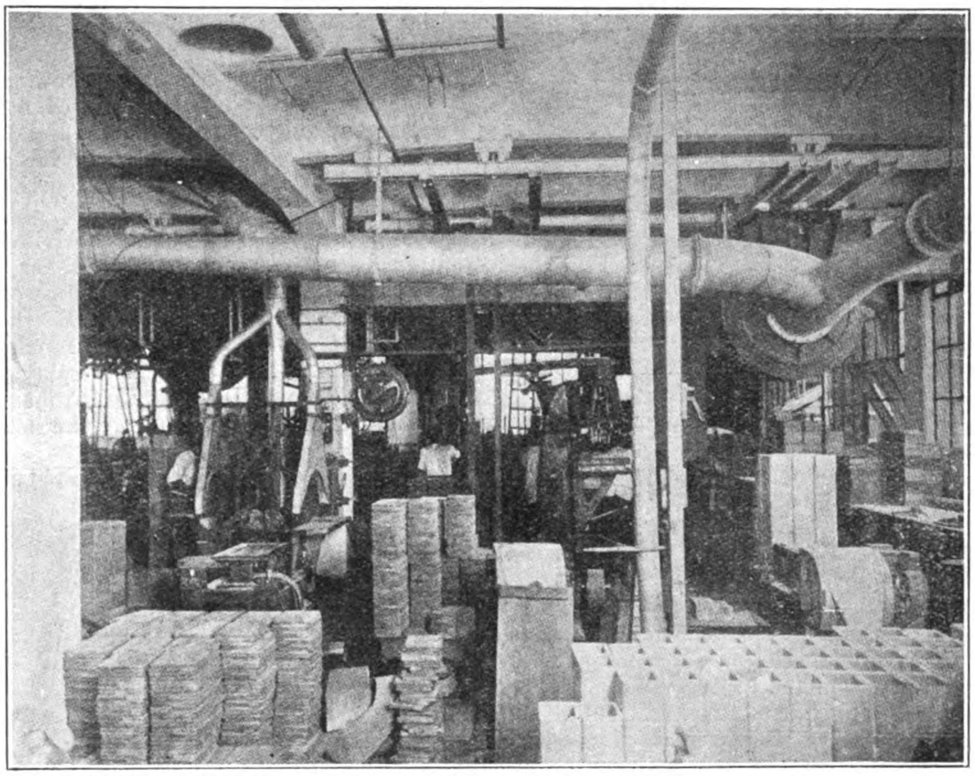
The first government budget for telephone extension had been started April 1, 1896, extending over a period of seven years. As the Japanese government had, in a large measure, adopted the approved practice of the American Telephone and Telegraph Company, the Nippon Electric Company received a substantial share of the orders placed, most of the apparatus sold being imported from America and Belgium, the principal work of the Company's shops being that of repair. The rapid growth in popularity of the telephone soon made made it evident, however, that the original plan for the import of American- and European-made apparatus would have to be abandoned and that manufacture in Japan would be necessary in order to keep ahead of government demands and give satisfactory service.

Nippon Denki Kabushiki Kaisha

(Nippon Electric Company, Limited)

Keeping pace with, and in recent years somewhat ahead of, the development of the telephone in Japan, has been the work of this affiliated Japanese Company, whose history is one of steady progress.

Prior to the year 1895, the Western Electric had been represented in Japan for three or four years by Takata & Company of Tokyo. During that time there was but very little telephone business, as the equipment then being used, standard switchboards and Gower-Bell type telephones with battery calling, were being made partly in the government shops and partly by local electrical factories. Early in the year 1895 Mr. Kunihiko Iwadare was appointed agent for the Western Electric Company in Japan, and one year later Mr. Thayer visited the country to investigate the possibilities of business. After Mr. Thayer's visit it was decided to make more permanent arrangements for handling the business in Japan, and in 1898 Mr. W. T. Carleton was sent to Tokyo to further the Company's interests as special representative.



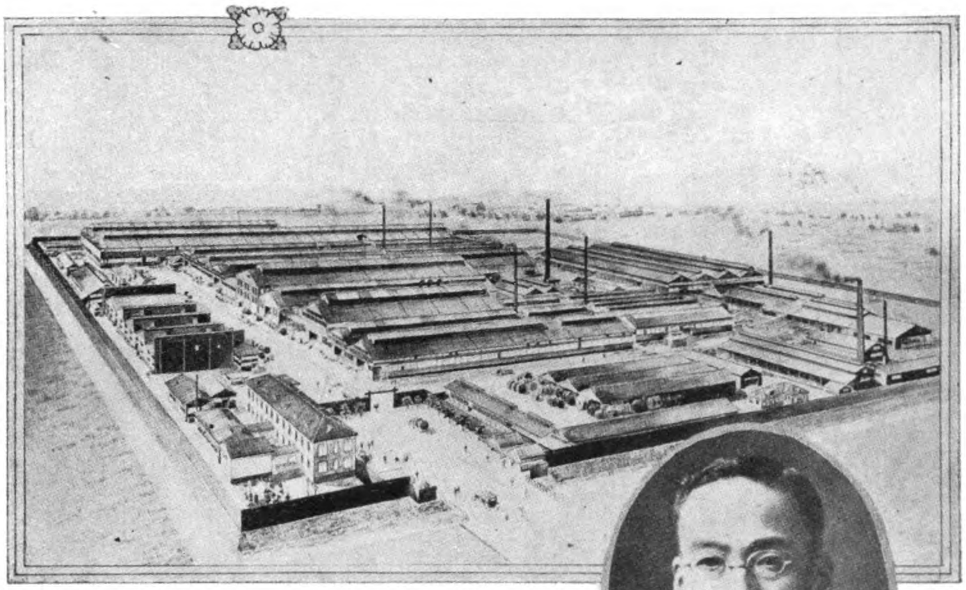
Nippon Electric Company: Carpenter Shop

On October 1, 1898 there was formed a limited partnership, the Nippon Denki Goshi Kaisha (Nippon Electric Limited Partnership) to handle the Western Electric agency, between Mr. Iwadare and Mr. Takeshiro Mayeda (who for many years was sales manager of the Nippon Electric Company). The capital subscribed by the partners was Y.50,000 (1 yen equals U. S. $0.50 at par exchange) fully paid. Of the original capital, Y.40,000 was spent in buying up the plant of an old motor and generator factory. This plant consisted of thirteen small buildings, having about 28,000 square feet of floor space; a small power plant and about seventy-five machines, fifty of which were small lathes. With this equipment the Nippon Electric Company started its manufacturing career in Japan. In spite of its inadequacy, this purchase of a going concern enabled the Company to enter into immediate competition for some of the small telephone work which was being done at that time, and permitted much more rapid advancement than would otherwise have been possible.

Growth of the Business

Toward the latter part of the year 1899, 1,769 *tsubo* (1 *tsubo* equals 36 square feet) of land were acquired, and a number of new buildings were constructed, including a new office building, a warehouse, a one-story factory building and a boiler house. All of the early buildings were of brick and of earthquake-proof construction. A machine shop was laid out, a new power plant (35 h.p.) was purchased, and new up-to-date machinery installed. With the completion of this new plant the old buildings were sold and the lease of the original property was given up.

While the outbreak of the Russo-Japanese war resulted in the government deferring its program of telephone extension, the Company was very busy with orders for the army and navy. The



Sumitomo Electric Wire and Cable Works, Osaka: Baron K. Sumitomo, President

activities of the factory were further increased by orders from the Chinese government, which were very satisfactory in size. In 1905, the first branch office of the company was opened at Osaka, with Mr. M. Matsushiro, later general sales manager, as Osaka manager. In the same year more land (1,484 *tsubo*) was acquired for the Tokyo plant.

In 1906 the business of importing electrical supplies had reached important proportions, and this, added to the increase in local manufacture, created a need for more warehouse space. To meet this need, a second three-story warehouse was built. In the same year additional land (2,080 *tsubo*) was purchased and the capital of of the Company was increased to Y.500,000. In the following year, in anticipation of an increase in the amount which the government would vote for telephone extension, a two-story brick factory building was constructed, having 14,000 square feet of floor space. Upon the completion of this building, in April 1907, the telephone assembly, testing and inspection departments, and the shop office, were moved out of the office building and located in the new factory building, as were also the wood-working, insulating and winding departments. That was fifteen years ago, when all the manufacturing activities of the Company were carried on in two buildings. To-day, the increased activities of the Company require about ten buildings for manufacturing purposes alone, and the combined floor space of all buildings has incerased from 43,000 square feet in 1907, to 320,000 in 1922.

Commencing in 1907, with the second government telephone extension, the Nippon Company has grown very rapidly. The amount voted by the diet (Japanese house of representatives) for this extension was Y.20,000,000 over a six-year period, but further money was granted from time to time, and a considerably larger amount was spent. It must be understood that these amounts voted by the government for extensions covered not only the cost of apparatus, but all expenditures for telephone work, and the proportion allotted to the purchase of apparatus was not a large percentage of the whole.

The year 1907 proved to be an active year. As the need for more manufacturing space was becoming important a comprehensive study was made of conditions and requirements, and a definite plan adopted for the extension of the Company's facilities. A new one-story brick "saw-tooth" roof building was erected on the new land which gave the Company about 10,000 square feet of additional floor space, and increased the total floor space to about 54,000 square feet. It was immediately put into use, all of the machine departments being moved in and the additional space thus made available made it possible to do away with a number of sheds which had previously been built.

At this time the motive power of the factory machinery was changed from steam to electricity, the machines being operated by overhead shafting, which in turn were operated by electric motors, the new layout including the installation of a new 200 horse-power boiler and a 100-kilowatt generator set.

One more important step was taken during this year, namely, the opening of a second branch office in Seoul, the most important city in Korea.

During the period 1908 to 1911 the factories were very busy. The telephone business in Japan continued to grow, and it became necessary for the Company to further increase its manufacturing facilities. Up to this time many piece parts, as well as certain types of switchboards, had been purchased from America and Europe, but during the year 1911 practically all telephone apparatus was manufactured in Japan.

The capital stock had been again increased in 1909 to Y.1,000,000. In 1910 the second one-story "saw-tooth" factory building was started, increasing the total floor space of the plant to about 67,000 square feet. Additional boiler and generating equipment was purchased and this necessitated the building of a new steel earthquake-proof chimney, six feet in diameter and 123 feet high. In 1911 the third section of the new one-story factory was completed, a new one-story building was erected for the nickel-plating and polishing departments, and a blacksmith shop was completed. Local conditions at that time made it advisable to erect small buildings, and a number of them were built for various purposes, such as oil and varnish storage, wood drying, etc.

In 1910 the Company opened a third branch office, this time in Dairen, Manchuria. In 1911 Mr. Eisaburo Hata, a former government telephone engineer, who had for a time been Superintendent of the Yokohama Wire Works, was engaged as shop superintendent. During the next few years great improvements were made in the

Sumitomo Electric Wire and Cable Works: Wire Drawing Machines

factory, resulting in a much stronger organization than had hitherto been possible. About 1,300 *tsubo* of additional land were also purchased in preparation for future growth.

At this period it became evident that the amounts to be allotted by the government to telephone development would be appreciably increased, and in order to prepare for this increase in business which required additional buildings and machinery, the capital of the Company was increased (1912) to Y.2,000,000, of which Y.1,500,000 was immediately paid up. Following this, work was started on the plans for a new two-story factory building, the sixth factory, to be constructed of reinforced concrete. This building was one of the first reinforced concrete factory buildings erected in Japan. The building was completed in 1913 and provided over 30,000 square feet of additional floor space for manufacturing and offices.

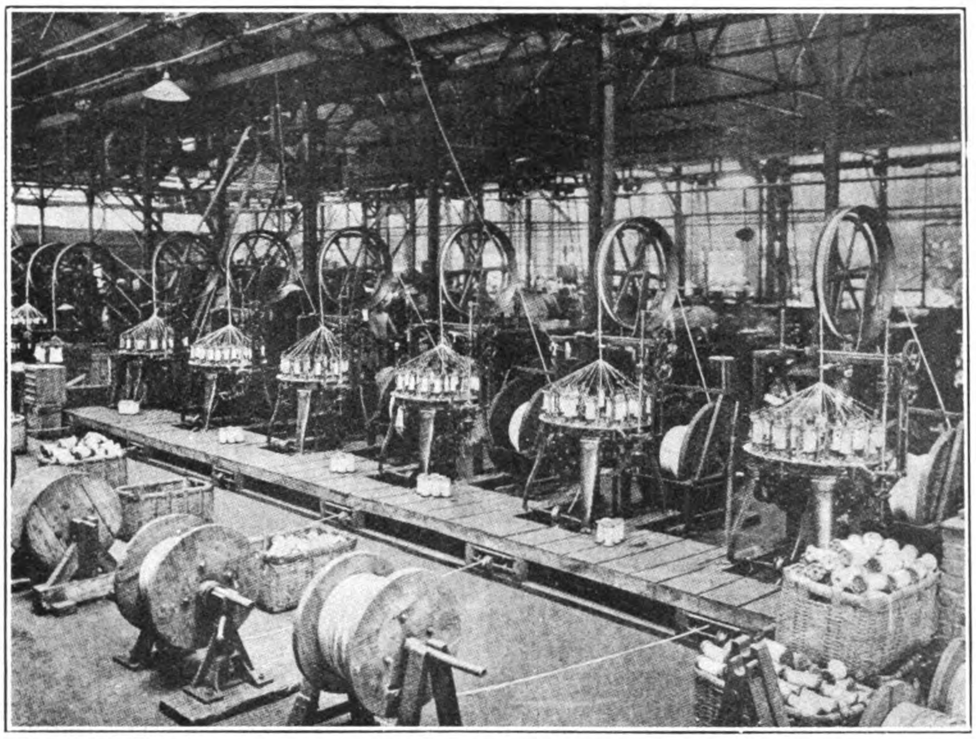
In 1913 a new department was started for the manufacture of telephone condensers ; and in 1914 a complete plant was installed for the manufacture of paper-insulated lead-covered cable. In the same year the manufacture of " Meggers " and watthourmeters was started.

In 1917 the capital of the Company was increased to Y.2,500,000; at the same time the employees of the Company were given an opportunity to purchase capital stock, and the Mitsui Bussan Kaisha, one of the largest and oldest banking and trading industries in Japan, became a stockholder.

October of the same year witnessed the incorporation of the China Electric Company, Limited, a joint Chinese government, Nippon Electric and Western Electric enterprise. This Company took over the business of the Nippon Company in China, and started the manufacture of certain telephone equipment.

In 1918 the capital of the Nippon Electric Company was increased to Y.5,000,000, and in 1919 a new three-story, reinforced concrete building was erected, providing about 40,000 square feet of additional floor space. This was the first three-story factory building erected by the Company.

In 1920 machinery was installed for the manufacture of black enamelled wire and switchboard lamps and the capital was increased to Y.10,000,000, full payment being completed early in 1923.



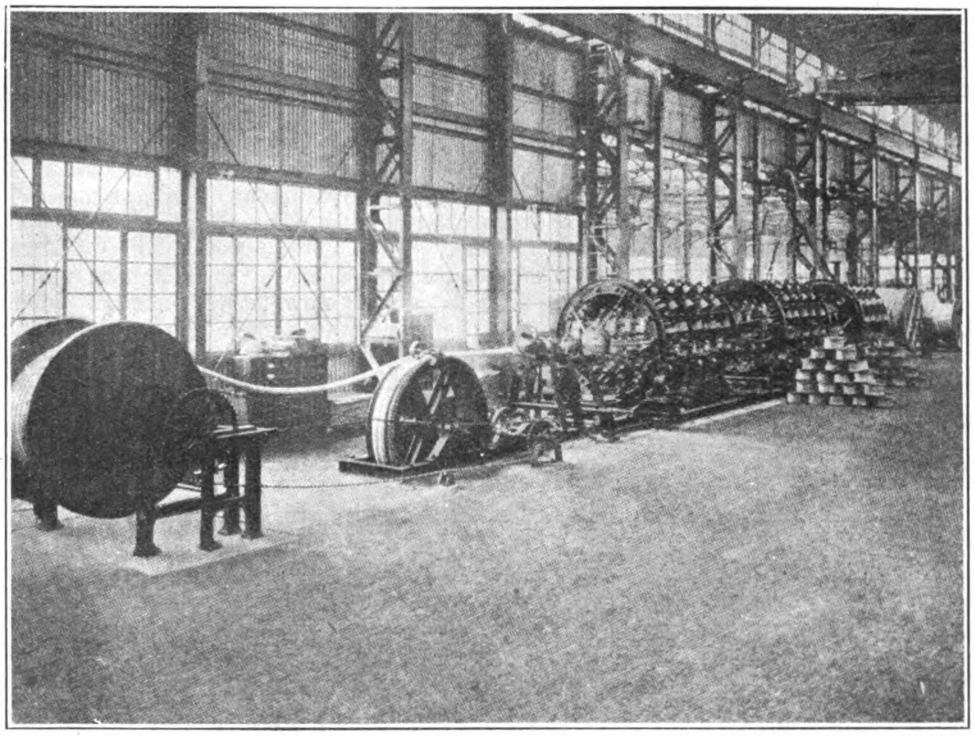
Sumitomo Electric Wire and Cable Works: Braiders

In the fall of 1920, an important affiliation was made between the Nippon Electric Company and the house of Sumitomo, one of the oldest and strongest manufacturing, banking and commercial organizations in Japan. The existing wire and cable manufacturing plant, known as the Sumitomo Electric Wire and Cable Works, was incorporated as the Sumitomo Electric Wire and Cable Works, Limited, with a capital of Y.10,000,000. To this new Company, the Nippon Electric Company sold its lead cable manufacturing plant and granted certain patent rights, manufacturing information and assistance relating to the manufacture of wires and cables.

In order to give an idea of the size and stability of the Sumitomo organization, and an understanding of the great variety of enterprises guided, so wisely and efficiently, by Baron Sumitomo, it will be of interest to first take a bird's-eye view of the foundation and development of this vast organization.

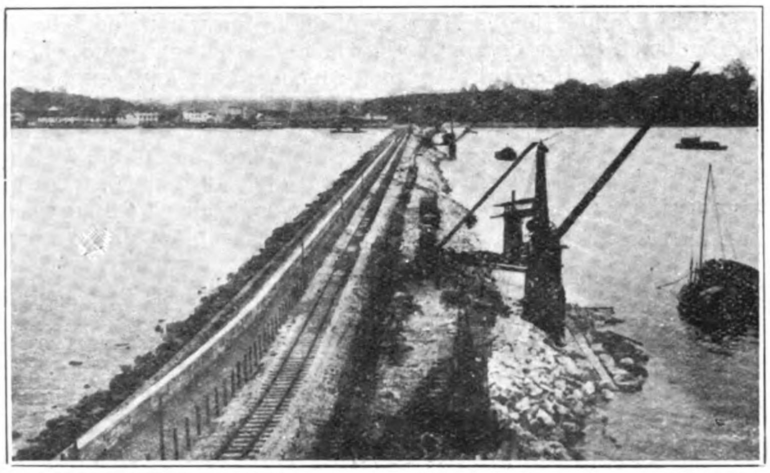
In 1690 a copper mine was discovered in Japan in which the Sumitomo family became interested, and it was with this humble beginning that the cornerstone of a great business was laid. This mine was subsequently named the " Besshi Copper Mine ", and for a number of generations the Sumitomo family devoted themselves largely to this enterprise.

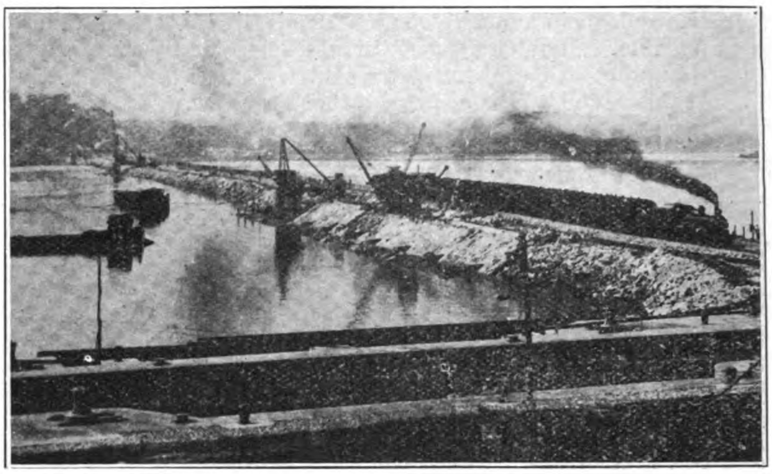
The next step came two hundred years later when, due to the growing requirements of the mining business, there were formed sales, warehousing and banking companies to develop more actively these branches of the business. Thus there came into being the Sumitomo Copper Sales Company, the Sumitomo Bank, and the Sumitomo Warehouse Company, with offices in Tokyo, Osaka and Kobe. This was followed by the organization of the Sumitomo Copper Works, formed to manufacture plates, sheets, tubes, rods, bars, etc. ; the Sumitomo Steel Works, the first steel fabricating company in Japan, comprising a large plant manufacturing a broad line of forgings and castings; the Sumitomo Fertilizer Works, which utilizes certain by-products of the copper mine; the Sumitomo Wakamatsu coal department, distributing the bituminous coal output of the Sumitomo mines ; and the Sumitomo Electric Wire and Cable



Sumitomo Electric Wire and Cable Works: Cable Making Machinery

(*Continued on page 66*).





The Completed Johore Causeway Linking Singapore Island with the Mainland The First Train

The Johore Causeway

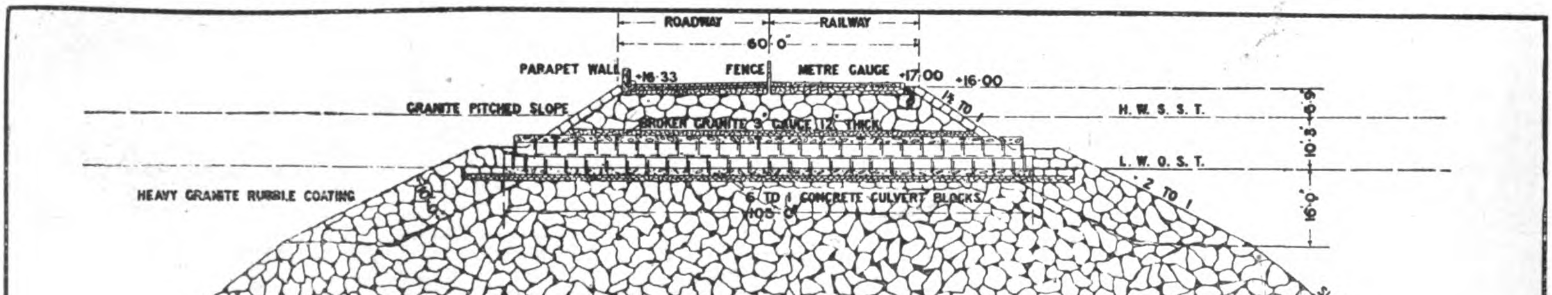
IN the July 1923 number of THE FAR EASTERN REVIEW was published a paper read by Mr. D. Paterson, M. Inst. C.E., before the Engineers Association of Malaya on the Johore Causeway. Since then, the work has been completed, and formally opened at the beginning of October. The causeway connects the island of Singapore with the state of Johore, which forms the southernmost point of the Malay peninsula, and is one of the greatest engineering works that have been undertaken in the Far East.

The following additional information from *The Engineer* will supplement the technical description in our issue of last July:—

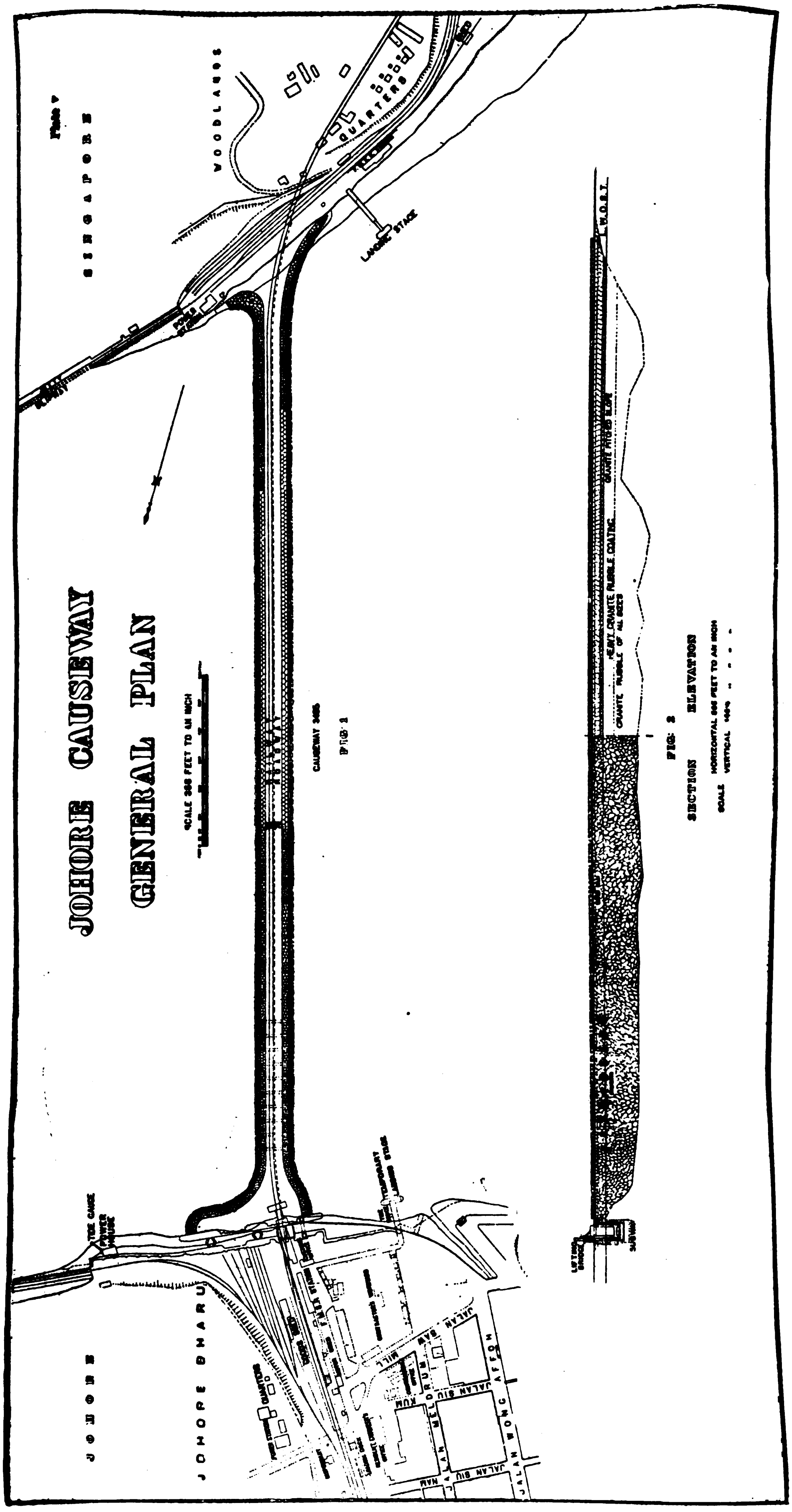
The causeway, which crosses the straits of Johore linking up the island of Singapore with the mainland, is formed on a rubble mound which is 3,465-ft. in length. When completed, the causeway will be 60-ft. wide at the top and will carry two lines of railway and a roadway 26-ft. wide. Its construction became necessary for the following reasons. The railway across the island of Singapore connecting the town and port with the straits of Johore was opened for traffic in 1903. It was originally built by the government of the Straits Settlements but was subsequently purchased by the government of the Federated Malay States. The Johore state railway, which was built at the cost of the state of Johore by the Federated Malay States railway department, and is now leased by the latter, was opened in 1909, and at the same time a wagon ferry service between the two railway termini—Johore Bahru and Woodlands—which face one another across the straits, was brought into use, the ferry boats carrying six goods wagons at a time. While, however, goods were carried from the island to the mainland, and *vice versa,* without transhipment, the passenger traffic was, until the opening of the causeway, effected by means of launches. A train ferry service had been considered but, at the time, it was thought that the expense of installing it would not be justifiable.

In July, 1918, the railway system of the Federated Malay Straits was connected with that of Siam and, since the Johore state railway joins up with the former, it then became possible to travel direct from Johore to Bangkok without change of carriage. The advantages which would accrue from filling up the gap between the island of Singapore and the mainland so that there might be direct railway connection from Singapore town not only with the F.M.S. but also with the capital of Siam then became more than ever evident. The question was of enhanced importance in view of the considerable growth in the goods traffic which had taken place since the wagon ferry had been instituted in 1909. In 1911 11,500 wagons were transported over the straits. By 1917 the number had increased to 54,000—which, at six wagons a time, represents an average of more than one trip per hour continuously. The number increased to 58,402 in 1921, and it was only by working day and night that the boats were able to cope with the traffic.

Moreover, everything at that time pointed to an increase in the rubber traffic, and on the recommendation of Mr. P. A. Anthony, M. Inst. C.E., the general manager of the F.M.S. railways, the government decided that something must be done to furnish increased transport facilities, and several schemes were considered. The first suggestion was that a bridge should be constructed, but it was negatived for several reasons. In the first place investigations showed that the available foundations were not satisfactory. The average depth of water on the line which the bridge would have to take is 46-ft. at low tide, and in some places it is as much as 70-ft.



Johore Causeway : Typical Cross Section



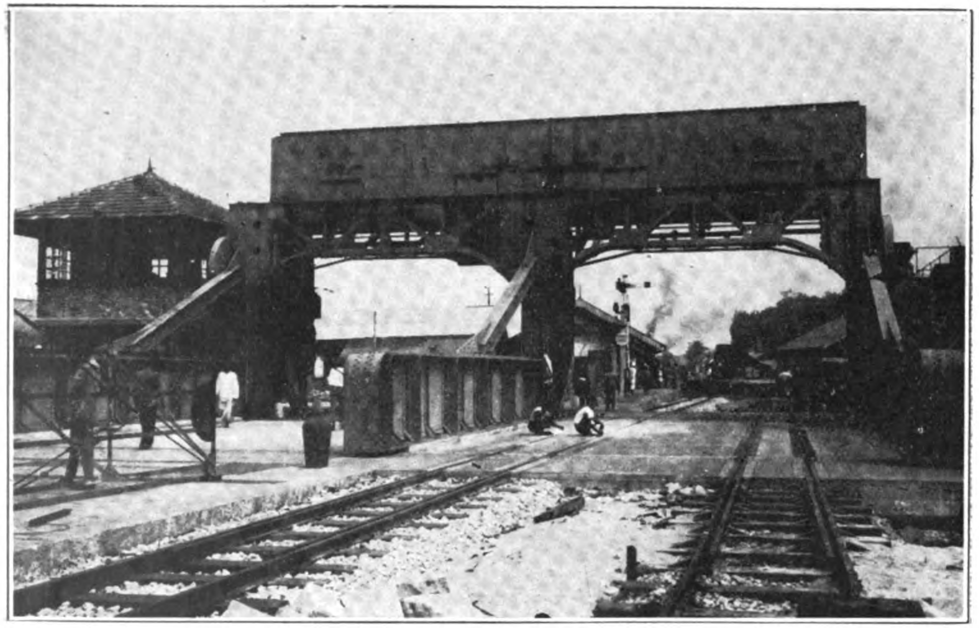
Then, again, a bridge, if constructed, would have entailed considerable expense in maintenance, and it would have had to be provided with an opening span. The first proposal to make a rubble causeway was made by Mr. W. Eyre-Kenny, M. Inst. C.E., who was at that time director of public works in the Federated Malay States, and eventually it was decided to construct a causeway from designs prepared by Messrs. Coods, Fitzmaurice, Wilson and Mitchell, of Westminster, who were called in as consulting engineers. A potent factor in the decision was that a causeway when once constructed would cost less to maintain than would a bridge.

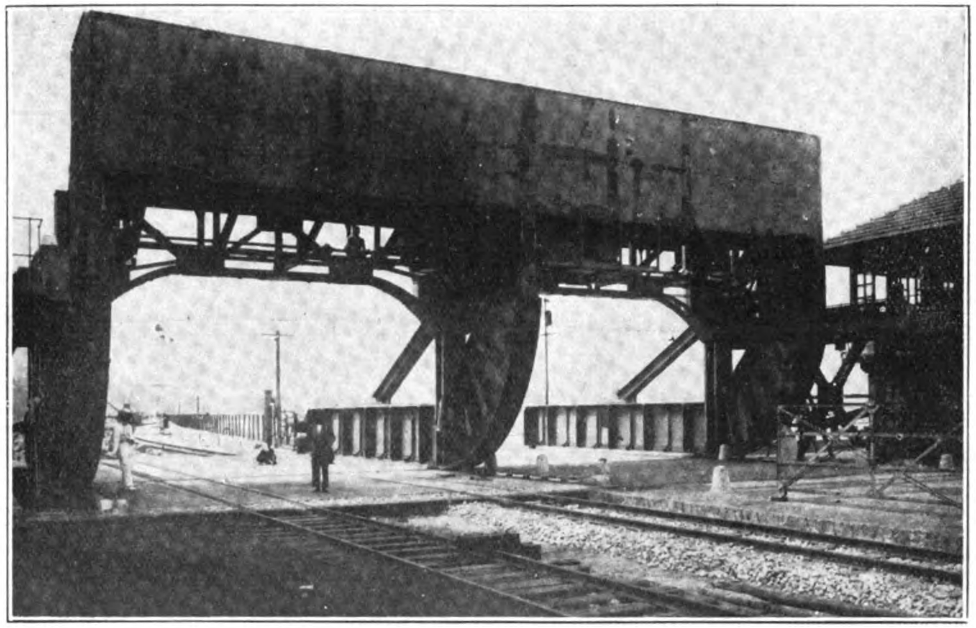
The causeway is being formed on a mound of stone rubble, the material for which is being quarried at Bukit Timah, in the island of Singapore, and on the small island of Pulau Ubin, which lies some 16 miles away in the eastern entrance to the straits of Johore. The greater portion of the mound consists of granite rubble of all sizes up to 5 tons, which was deposited exactly as it comes from the quarry. On each side of the bank commencing at 15-ft. below low water of spring tides a coating 10-ft. thick of heavy rubble, ranging in weight from 5 tons down to ½ ton, was deposited and finished off to a slope of 2 to 1. This coating was taken up to a height of 4-ft. above L.W.O.S.T., and its upper surface was brought up to form a berm so as to provide against possible displacement of the upper portion of the work by wave action. Blocks of 6 to 1 concrete were laid at the back of the berm to form a toe for the granite rubble pitching, which was laid to a slope of 1½ to 1 on the upper slopes of the causeway. The rubble was brought to the site in 300-ton hopper barges with opening bottoms, which were towed from the quarry by tugs and then moored in position by ropes attached to moorings. The depositing of stone in this manner was carried on from both ends, and when the channel had been narrowed down to about 1,000-ft., it was found that the currents through the opening were about 5 miles per hour. Stone was then deposited all over the channel but not up to such a height as to interfere with navigation until the lock was ready for the passage of vessels. When the mound had been raised as high as was practical by deposition, short lengths, sufficient to permit of the erection of a derrick crane were built up by a floating crane. The building of the superstructure was then effected by means of the derrick crane. The maximum quantity of stone deposited in any one month was 55,000 cubic yards. The roadway consists of a bed of 9-in. of granite rubble closely packed on edge with a 6-in. layer of granite metalling on the top. It is calculated that when the causeway is completed it will contain over 1½ million cubic yards of stone.

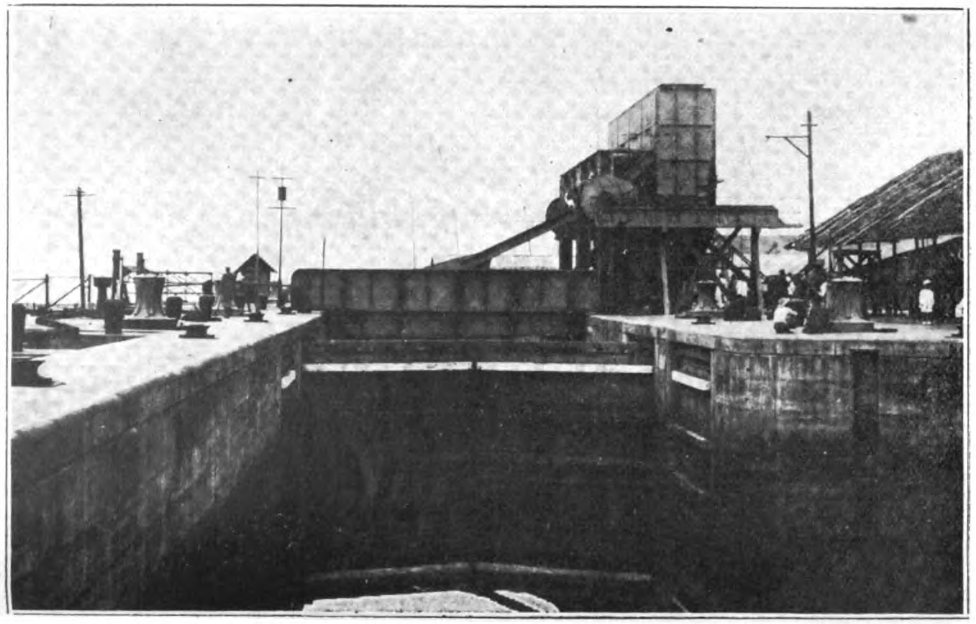
A disadvantage of a structure of this kind is that it blocks the straits, and special provision has to be made for the passage of craft from one side of it to the other. To get over this difficulty a lock has been formed in the mole at the Johore end. As a matter of fact, though there is deep water at the eastern end of the straits—

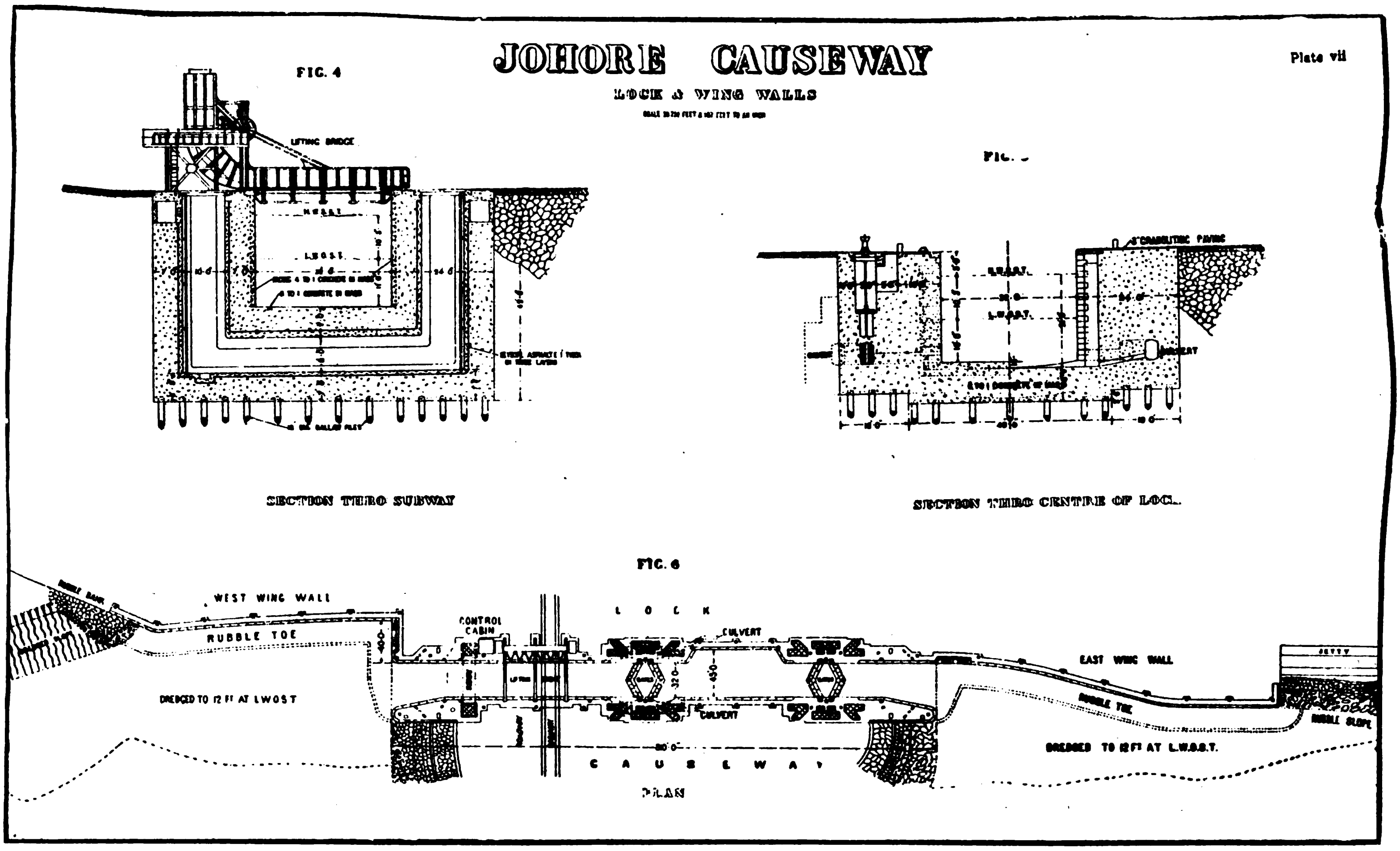
THE ROLLING LIFT BRIDGE OVER THE JOHORE CAUSEWAY

Built by Sir William Arrol & Company, Ltd., of Kilmarnock









where, by the way, it is proposed to establish the new British naval base—the western end is shallow and can only be used by small vessels. It was not necessary, therefore, that the lock should be of any great size. Actually, it has been made 170-ft. long between the gates by 32-ft. wide at the gates, though it is widened out to 45-ft. for a certain portion of its mid-length, so as to allow of a number of boats entering it at the same time. It has been furnished with a double set of gates since, owing to the tides, the flow of water changes in direction. The depth of water on the sills at low tide is 10-ft. For the regulation of the water level in the lock a culvert, 5-ft. high by 3-ft. wide, is provided in each side wall, and water is admitted into or released from the lock by means of hand-operated cast iron sluices which are furnished with gun-metal faces. From the culverts there are five openings, 2-ft. 6-in. by 2-ft., through each side wall. In each of the recesses into which the gates swing there are also three outlets 1-ft. in diameter, which are for the purpose of flushing out deposits of silt. The lock gates are of steel. They are 24-ft. in height by 20-ft. long and 3-ft. 6-in. wide at the centre, and are divided into seven decks. The outer plates are curved to a radius of 22-ft. The gates are operated by hand-worked capstans, each leaf having hinged to it a steel joist which has attached to it a cast steel rack. The lock has been open for traffic since January of this year.

With the lock cutting across the causeway it was, of course, necessary to have some means of spanning the former, which could be taken away so as to permit of the passage of vessels. A bridge of the rolling lift type was chosen, and its construction was entrusted to Sir William Arrol & Co., Limited, of Kilmarnock. It is the first of its kind to be erected in the Straits Settlements. The moving part of the bridge weighs 570 tons, and it is operated electrically by a 35 horse-power motor, hand gear being also fitted for use in case of breakdown or failure of the electric current. It is estimated that against a fresh breeze it will take 3½ minutes to lift the bridge by power as compared with 19 minutes with four men. The structure has a clear span of 32-ft. and is 57-ft. wide. It is composed of three main plate girders, 38-ft. long and 5-ft. deep, with cross girders, spaced 7-ft. apart, to which are attached the longitudinal rail bearers and the floor troughing. At the rear end of the main girders are attached segmental girders curved to a radius of 14-ft. 1½-in., which carry the ballast box. The latter, which extends for the full width of the bridge, measures 9-ft. by 7-ft. 6-in. The ballast consists of concrete and pig iron. The segmental girders rest on level track girders, which are carried on beam grillages anchored into the solid concrete of the dock wall, the whole being concreted up to the level of the track girders. The length of roll of the bridge is 20-ft., and the track plates have projections 6-in. by 3-in. by 2-in. high, which engage with slots in the segmental girders to prevent any motion of the bridge except rolling motion. The power for operating the bridge is transmitted from the motor through gearing to operating pinions at the centres of the rolling segments at each side of the bridge. These pinions engage in two cast steel spur racks which are bolted to girders carried on trestles, which are, in their turn, bolted to the bridge abutments.

In order to obtain railway communication across the straits at the earliest date possible, the making of the roadway portion of the causeway was undertaken first. As soon as a half width bank was completed, a temporary single track was laid over which the traffic was conducted, while the remainder of the bank was being completed and the permanent rails laid. The reason for this procedure was that, if the railway portion had been constructed first, the roadway portion would have been cut off from the Pulau Ubin quarry, unless the barges carrying the stone were passed through the lock, which would have meant the wasting of a good deal of time and have caused much inconvenience.

At the moment of writing we do not know what effect, if any, the causeway has had upon the general conditions in the straits. The complete closing of the channel has, of course, interfered with the natural flow of the tides, and it will be interesting to see whether there will be any untoward consequences. It was anticipated, that unless precautions were taken to prevent it, there might be an accumulation of floating refuse against the causeway at the Johore end, and therefore ten circular culverts, each 5-ft. in diameter, have been formed from side to side through the structure near the lock, with their inverts at L.W.O.S.T.

It is intended to take advantage of the construction of the causeway to lay on the latter the pipe line which is to convey to Singapore the new water supply from the Pulai reservation. In order to lead the pipe line past the lock a subway 11-ft. 6-in. wide and 8-ft. high has been formed.

The contract for the whole of the works was given to Topham, Jones and Raillin, Limited, of London, and operations were begun

(*Continued on page 95*).

Electrical Equipment of the Penang Hills Railways

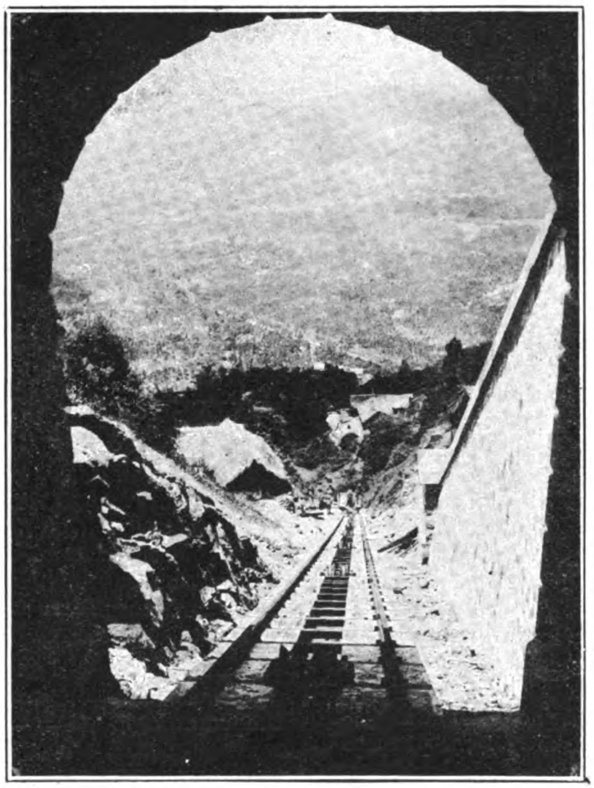
Paper Read Before The Engineering Association of Malaya, Dec. 16, 1923, By Thomas Rogers, A.M.I.E.E.

THE Penang Hills Railway is divided into two sections and may for all purposes of operation be considered as two distinct and independent lines, the top section being a complete duplicate of the lower section in so far as the electrical equipment, telephones and signalling systems are concerned. Therefore in the remainder of this paper I shall only consider one section, the other can be understood as a complete duplicate.

The makers of the switchboard, motors and controller equipment are the British Thompson Houston Co. and the makers of the brake solenoids are Messrs. George Ellison & Sons.

The switchboard consists of a main double pole switch to which the incoming mains are connected, from this connection are led direct to the top contacts of a double pole circuit breaker, thence through one double pole switch to the controllers, and through a second to the brake solenoids, the latter being protected by a pair of fuses. The motor is a standard B.T.H. D.C. motor of 75 h.p. and fitted with interpoles.

There are two controllers, the first is used to control the direction of the motor, by changing the connections to forward or reverse as may be required, the second controller is the power or operating controller, and when moved forward controls the supply to the motor and therefore its speed, this controller can also be used for braking, by simply reversing its motion from forward to reverse and it is this brake which is used for controlling the speed of the train when the load going down is heavier than the load coming up.



Lower End of Tunnel

Braking

This is perhaps the most important part of the whole equipment and is entirely independent of any braking equipment fitted on the cars themselves, except that should any unauthorized person apply the brakes on the cars, then it would be impossible to operate the motor as the overload protection would operate tripping out the circuit breaker every time the driver attempted to use his controller.

The brakes in the engine room are four in number

1. The hand brake
2. The solenoid brake
3. The energency brake
4. The dynamo brake

1. The hand brake is operated direct from the operating platform and is applied by simply pulling a lever which has a ratchet attachment to prevent slipping, should the driver leave go for any reason.

2. The solenoid brake is operated by the No. 1 controller and remains clear all the time unless the main circuit breaker opens or the controller is moved to the off position.

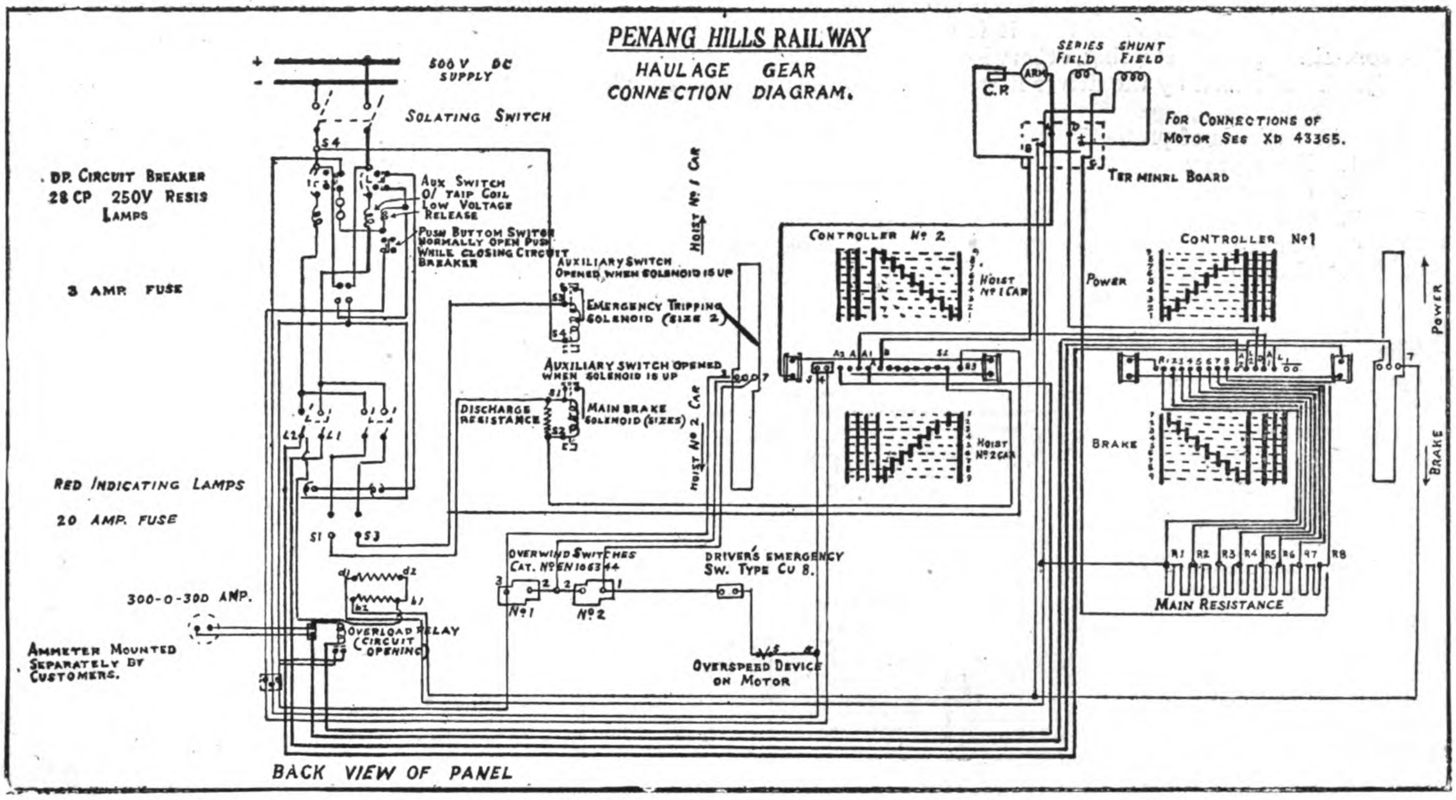
3. The emergency brake is controlled by the operation of the main circuit breaker, when the circuit is broken owing to the circuit breaker tripping it releases the plunger of the emergency brake solenoid, attached to this plunger is a weight so arranged as to strike the end of the brake lever, in striking this it releases a ratchet and allows a heavy weight (approx. 650 pounds) to apply the emergency brake direct on the main driving wheel.

4. The dynamo brake is operated by the No. 2 or power controller and we have found in practice that with a full load of 3 tons 12 cwt. on the descending car, and the ascending car empty (which is of course the heaviest possible load) that a braking current of 100 amperes will bring the cars to

PENANG HILLS RAILWAY

Loop Line

Half Way Curve



practically a stand still from full speed, and about 50 amperes will keep the car within its correct traveling speed.

These figures in horse-power as measured at the motor were equivalent to 40 h.p. and 20 h.p. respectively, so that according to the position of the controller, the descending car has to drive by its weight and speed the motor as a dynamo and develop the equivalent of 40 h.p. This figure does not represent the full braking power of this method which if fully applied would be in the neighborhood of 100 h.p.

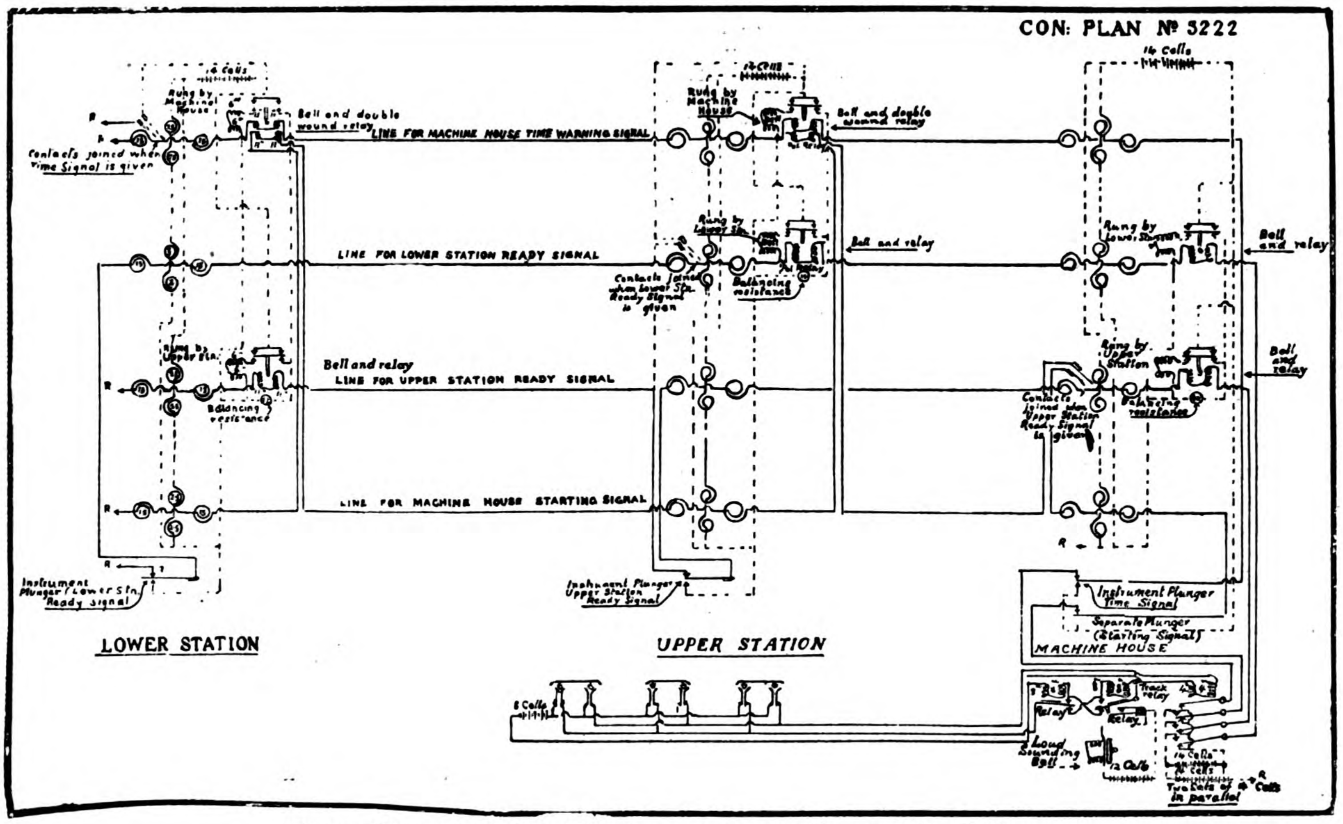
This method of braking is very convenient and also very efficient, and has the very great benefit of saving the continual wear on brake blocks which would otherwise take place if they were kept in continual operation for 12 minutes, this being the time it takes to travel from one station to another.

The energy generated when using the dynamo method of braking is dissipated in heavy grid resistances supplied for that purpose.

Protection

The methods of protection are very thorough and practically every possible source of trouble has been anticipated and prepared for.

The protection has been based on the operation of the main circuit breaker, and all the various methods simply have the effect of preventing the breaker being closed, or by causing it to open. The effect of the circuit breaker opening is to apply the emergency brake and the solenoid brake automatically as explained previously.



Wiring Diagram of Signalling Instruments for Penang Hills Railway

There are seven methods of opening the circuit breaker, of these five are arranged in series, so that it is necessary to have them all in commission before starting, otherwise the circuit breaker cannot be closed. If closed by the driver it would simply fly open again.

The different methods of protection may be classed as follows:

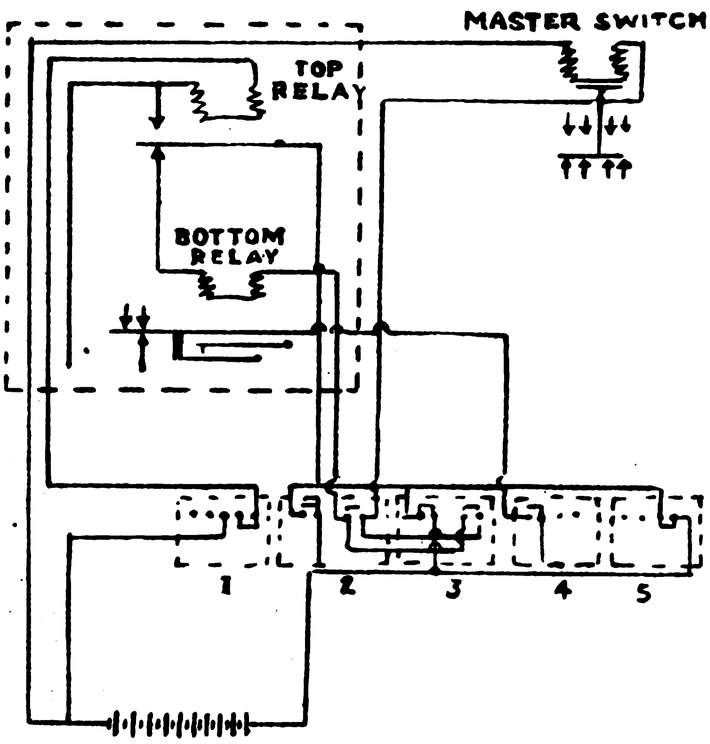
1. Emergency
2. Overspeed
3. Car No. 1 overrunning its correct stopping place.
4. Car No. 2 overrunning its correct stopping place.
5. Braking overload
6. Low voltage release.
7. Motor overload.

1. The emergency protection is operated by the driver from the control platform, and consists of a switch which opens the circuit through the no volt release coil. When the driver pushes the handle it opens the circuit and causes the circuit breaker to open automatically, applying the brakes.

2. The overspeed protection is fixed on the end of the motor shaft and would come into operation in the event of a heavy load on the descending car running away down hill and driving the motor at a speed above normal, this overspeed device would then operate and trip the circuit breaker and apply the brakes.

3 and 4. *The Overrunning Protection.*—This is similar for both No. 1 and No. 2 cars, but has independent switches, this is obviously necessary as otherwise should a car have tripped out the circuit breaker it would be impossible to close it again, unless there was some method of allowing the car to descend but not ascend.

This is done by special contacts on the reversing controller and these are so arranged that the contacts short circuit the tripping switch on the descending car, leaving the ascending car to trip out the circuit breaker should it over-run its correct stopping place. Reversing the controller reverses the switches.



Hills Railway Switch Connections

No. 1. Switch clears top relay
2. „ rings bell and reverses indicator
3. „ „ „ „ „ „
4. Operates top relay
5. Clears „ „

Bottom connections normally closed opened by car
Top „ „ open closed „ „

Note.—Purpose of top relay is to prevent bell ringing and also to prevent indicators being reversed when carriage is leaving upper station.

For instance should No. 1 car over-run the circuit breaker can only be kept in when the controller is in the correct position to drive No. 1 car in a downward direction. Should the controller be moved to the ascending position by mistake the circuit breaker would at once open before even the power controller could be operated at all.

Therefore should a car over-run from any cause no power can be applied to it except to cause it to move in the opposite direction —that is downwards.

5. *Braking Overload.*—This protection is partly against the driver and would only come into operation should the speed become too high and the driver suddenly apply the dynamo brake too rapidly, this would cause a very heavy current to flow and would trip out the circuit breaker and supply the brakes, bring the cars to a stand-still and cause all operations to be started over again.

6. *Low Voltage Release.*—This protection is to deal with a possible failure of supply and should the power suddenly stop for any reason the circuit breaker will open and apply the brakes.

7. *Overload.*—This protection is mainly for the motor itself and would come into operation should a fault occur on the motor, or it would also operate should for any reason the automatic or hand brake be applied on a car or cars, thus preventing the driver from attempting to pull up the track as well as the passengers in the cars.

The controllers themselves are also fitted with an interlock so arranged that it is impossible to reverse the controller, until the second or power controller has been brought back to the clear or off position. This interlock also prevents the reversing controller being operated at all until the power controller has been moved to the off position.

The last and a rather possible source of trouble has been allowed for, and that is that the circuit breaker having operated by one of the above protections, the driver might leave his control platform without returning his controllers to the off position in order to close the circuit breaker, thus possibly starting the trains without any one being on the control platform. This has been overcome by arranging special contacts on he reversing controller which only allow the circuit breaker to be closed when the controller is in the position.

Lighting

The train lighting is carried out by means of batteries, switches and fuses being supplied for each compartment circuit, with a main fuse to protect the battery.

The batteries are of 100 amperehour capacity and there are complete spares so that one set is charging whilst the other set is in commission on the cars.

The station lighting is supplied from the municipal mains—the top station is alternating supply, the middle station is at present supplied by a motor generator operated from the railway supply main, but will eventually be supplied on the alternating current system from a local sub-station to be erected near the middle station.

The lower station will be supplied from a static sub-station near the foot of the hill.

Supply

The system of supply for the railway had to be made to suit the railway specifications which called for direct current.

In order to supply this economically and to fall in line with the complete electrical scheme for Penang, it was decided to transmit direct to the top of the hill at 11,000 volts, and transform there in a sub-station to D. C. supply for the railway, and thus also enable a supply of A. C. current to be available for lighting purposes on the hill without having long overhead transmission lines up the hill itself. This will also enable Prai station when finished to supply power direct to the hill sub-station.

From the municipal sub-station which is situated near the upper railway station, there are feeders running to both the upper and lower stations, the return wire in each case being bare copper wire which is run along the edge of rail.

The cables supplying the hill are run up the railway itself, on the bottom half the cables are run inside the track hanging on the rail sleepers. On the upper section there are three wires, two A. C. cables and one D. C. cable, and they have been run on brackets at the side of the track supported from the holding down bolts of the rail sleepers.

The copper return wire from the middle station has been run along the rail and held in place by small clips attached to the rail sleepers.

Signalling and Telephones

The signalling system has been supplied and designed by

Messrs. Tyer & Co. and whilst somewhat complicated has given every satisfaction since it was installed.

The visual signal consist of four holes in a plate, at the back of which is a second plate marked to show through the holes with the signal clear. The signal itself consists of a round red disc marked in white with the word READY.

These discs are operated magnetically by means of coils fitted on the back of the signal plate, and the currents are passed through each coil in turn, first in one direction by the operation of the different instrument switches, and then in the opposite direction by the operation of a master switch, which has the effect of returning all the signals to clear.

The instruments are fitted in the engine room and on the upper and lower station platforms, the master switch is fixed in the engine room and has its own main battery. All the signals at each station and also in the engine room are returned to clear by one operation of the master switch.

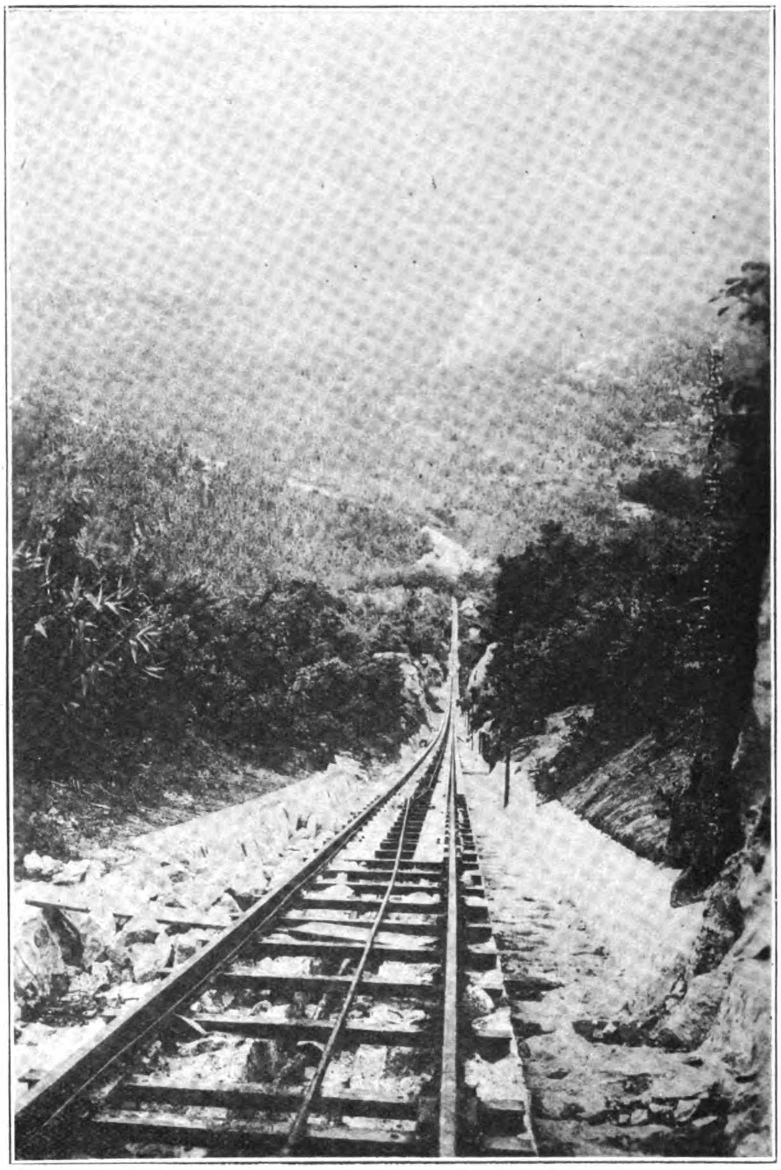
The method of operation is as follows:

Just before the correct starting time the driver depresses his switch, this gives the warning signal TIME, and rings a bell at the upper and lower station platforms, he continues to give this signal at intervals until the station master at the lower station answers by depressing his switch, which rings a bell at the upper station and in the engine room also giving the READY visual signal on all three instruments.

The station master on the upper station now depressed his switch which rings a bell at the lower station and in the engine room also giving the READY visual signal on all three instruments.

The driver has now his TIME signal, lower and upper READY signals, he then gives the starting signal which rings bell at upper and lower stations and shows the visual signal STARTING. The signals are now complete and the driver starts the train.

The signals are returned to clear by the train itself. The connections for this are made by means of special track switches and these have to be so arranged that the signals can only be returned to clear by the ascending carriage and not the descending carriage.



A Beautiful Tropical Panorama, Half Way Down the Penang Hills Railway

This is done by means of an extra track switch which operates a special stick relay, the purpose of which is to prevent the signals being returned to clear by the descending car, the latter passes over the first track switch which operates the stick relay and opens the circuit of the master switch which owing to the sticking action of the relay, remains open until the relay is cleared by the operation of the last track switch, this switch having cleared the stick relay the ascending car can now operate its correct track switch and return the signals to clear.

The track switches are spaced at intervals along the track near the upper station and one part of their duties is to return the signals to clear, another is to ring a warning bell situated just above the control platform in the engine room, the first warning bell is given by the fourth track switch situated about 30 feet below the station and gives the driver warning to stand by; the brake signal is given by track switch No. 3 which is placed in such a position that the driver should apply the brakes at full power whenever the bell rings.

Should the driver fail to apply the brakes in this position then just above this point the car strikes against the overwinding safety device which trips out the circuit breaker and applies the emergency brake as explained previously.

The line wires for connecting up the different signals are carried overhead on telephone poles in a manner similar to telephone wires; at each end of these wires they are joined to lightning arresters of the carbon type, these consist of two carbon blocks separated by a sheet of mica with holes pierced through, should lightning strike the line it jumps across through one or other of the holes in the mica to the second carbon block which is connected to earth.

The telephones on the railway may be classed as service telephones and track telephones. The service telephones are arranged to speak from one station to another and also from the bottom through the middle station to the top station. These are independent telephones and have no connection with either the track telephones or the post office lines.

The track telephones are carried on poles run adjacent to the track, and are used by means of special poles one of which is carried on each car. These telephones are for the purpose of speaking from the train to the engine house in the event of trouble either on the car or on the track.

The method of using them is very simple and the car conductors can use them quite well to communicate with the drivers. If a car conductor has trouble and wishes to stop the car he does so by simply joining the two wires together by means of a brass bar on the end of a pole, this rings a bell on the engine room telephone, the driver at once applies the brakes and when the car has stopped the conductor hooks the pole on in such a way that it makes contact to both wires, one contact on the bar, the other on the hook. The telephone is then ready for use, the conductor can speak to the driver and when finished he lifts off the pole and everything is clear again.

In the event of trouble with the signals the telephones can be used for despatching the trains.

The Johore Causeway

(*Continued from page 91*).

in 1919. As the firm had recently completed extensive works in connection with Singapore harbor, it was in a particularly favorable condition to undertake and carry out quickly such an important work as the building of the causeway, the cost of which is, we understand, estimated at 17,000,000 dollars, or about £1,955,000. This outlay will be borne jointly by the governments of the Federated Malay States, the Straits Settlements, and the Protected Malay State of Johore. Mr. James Brown, M. Inst. C.E., is the chief superintending engineer in the Malay States on behalf of the consulting engineers; while Mr. D. Paterson is the resident engineer under Mr. Brown in actual charge of the causeway.

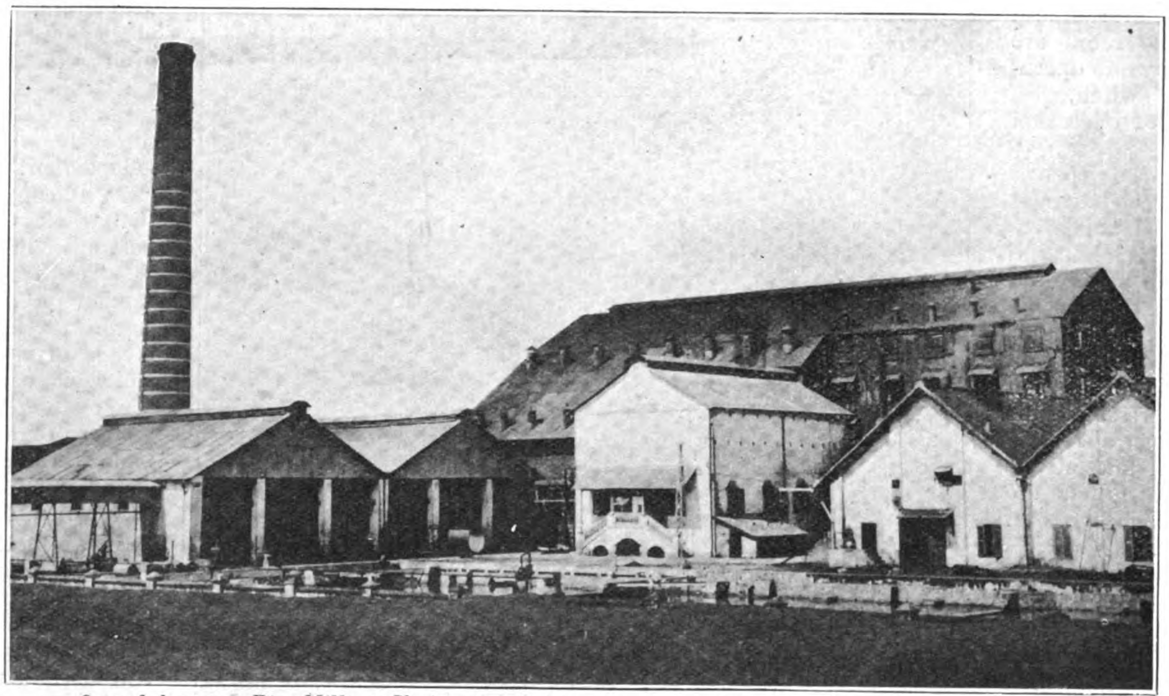
Industries of Indo-China*

GENERAL

THE different countries of the union offer splendid openings to industries of all kinds as the raw material found there is exceedingly varied.

The first question, as in all newly opened countries, is that of transportation, and it must be confessed that in spite of the great efforts which have been made to improve the means of communication in Indo-China there yet remain huge tracts—notably in Laos and in the mountain region of Upper Tonkin—where little as yet has been done in this direction. In Laos, on the Siamese as well as the French side of the frontier, the only important trade is that in teak exploited by the Société de l'Est-Asiatique, the resultant timber being floated down the Me-kong.

On the other hand in the deltas and in the mountains where means of communication already exist, works are being established daily and thanks to the abundance and variety of raw material and to workmen who are generally adaptable and clever, very remarkable results have been obtained. This development is especially striking in Tonkin where conditions are very favorable, and for this reason the following article deals chiefly with Tonkinese industries.



One of the many Rice Mills at Cholon near Saigon, the centre of the Rice Industry in Cochin-China

Cambodia

Industrial operations in Cambodia though recent are full of promise. Attention may be called to that already mentioned in the connection with agriculture, viz., the Compagnie Générale des Soies de France et de l'Indo-chine, to which may be added the Comptoir de l'Industrie Cotonnière and to the saw-mills, including those of the new Société Forestiere du Mé-kong. At Pnom-Penh a mill for the husking of rice has just been opened which can handle over 30 tons of paddy per day and which betrays the desire of the Cambodian rice growers to become independant of the middlemen and port of Cholon-Saigon and to export the rice grown in the rich province of Battambang directly from the port of Pnom-Penh, accessible to sea-going vessels.

Cochin-China

A. INDUSTRIAL CENTRE OF SAIGON

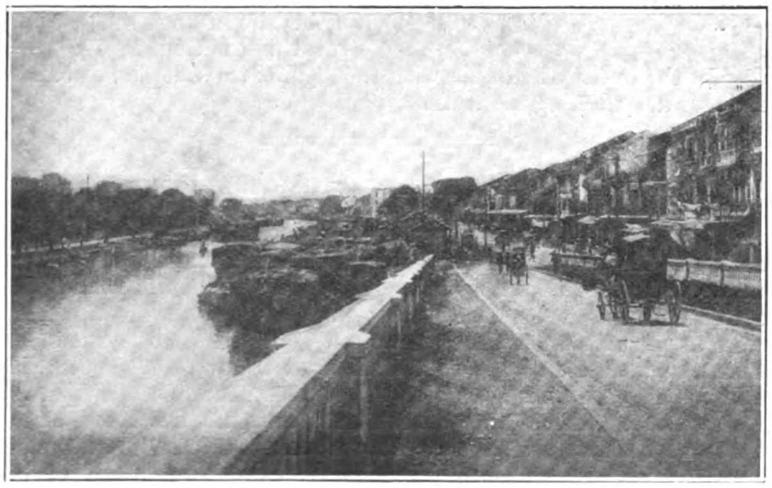
At Saigon, the capital of Cochin-China, several industrial enterprises are to be found.

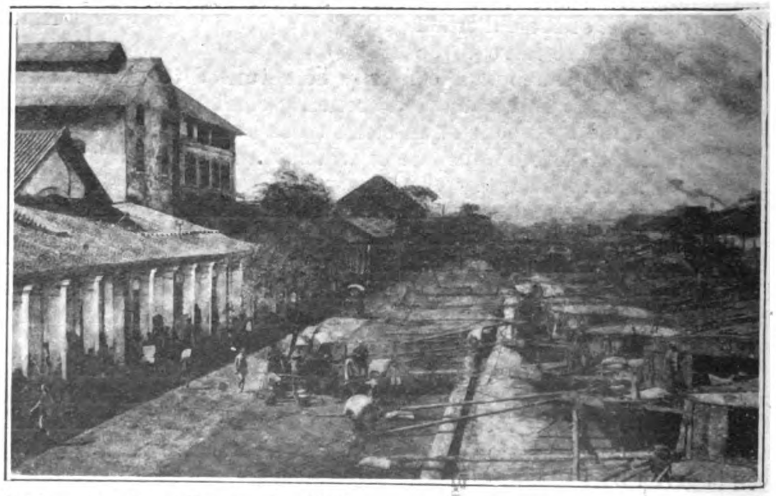
Rice-mills.—The milling of paddy occupies an important place. The powerful Société Française des Distilleries de l'Indo-chine, of which more will be said when treating the industries of Tonkin, as well as the Chinese and French rice-mills, are naturally much interested in milling of paddy, and among these latter mention may be made of the four mills of the Société des Rizeries d'Extrême-Orient with a capital of 25 millions francs, which can turn out every day 2,500 tons of No. 2 white rice.

The number of these mills is continually increasing in the form of small husking plants driven either by electricity or steam and owned chiefly by Annamites or Chinese, some of which can handle yearly up to 5,000 tons of paddy.

Other Agricultural Industries.—As the outcome of the rubber plantations of the country the Compagnie du Caoutchouc manu-

*Article written by the Department of Economic Service of the Indo-Chinese Government.





THE BUSY QUAYS OF CHOLON.—Junks unloading Rice for the Mills

Aerial view of Cholon and its Rice Mills

The Société Française d'Entreprises de Dragages et de Travaux Publics with a capital of 5 million francs has by means of its powerful modern dredgers removed during the last ten years over 100,000,000 cubic yards of mud; it also owns an important repairing workshop.

The Compagnie des Eaux et d'Electricité de l'Indo-chine with a capital of 10 million francs distributes electricity to Saigon-Cholon and Pnom-Penh. The central station at Sho-Kwan (Saigon-Cholon) of 7,000 h.p. supplies Saigon-Cholon and, by means of high-tension lines over 37 miles long, the towns of Jia-Dinh, Bien-Hoa, Thudaumot and Laithieu as well. The same company supplies water to these towns. The Sho-Kwan central station has been doubled by the addition of another station of 10,000 h.p. (to be brought up eventually to 20,000 h.p.) in order to feed the wireless post and the tramways, for which a new company, the Energie Electrique Indo-chinoise with a capital of 10,000,000 francs has been formed.

Wireless Post.—This post, just opened, secures direct communication between France and Indo-China, and it comprises: (1) an emitting centre close to the new central of Sho-Kwan above mentioned, with two 500 kw. high frequency alternators and with antennæ carried by eight 820-ft. masts; (2) a receiving station and (3) offices situated in the commercial centre of Saigon.

The opening of this station has made Indo-China independent of foreign cables and given it a cheaper and much more rapid service when communicating with the mother-country and is therefore of great political importance, while on the other hand the trade of the colony will benefit enormously.

From a technical point of view this station is the largest of any in tropical countries in the whole of the Far East., and is in fact the third largest in the world, as it is equal to that at Bordeaux-Croix d'Hins and is second only to that at Melun-Sainte-Assise, all three in French territory.

Outside this main wireless station at Saigon a system of smaller posts will ensure communication all over the union.

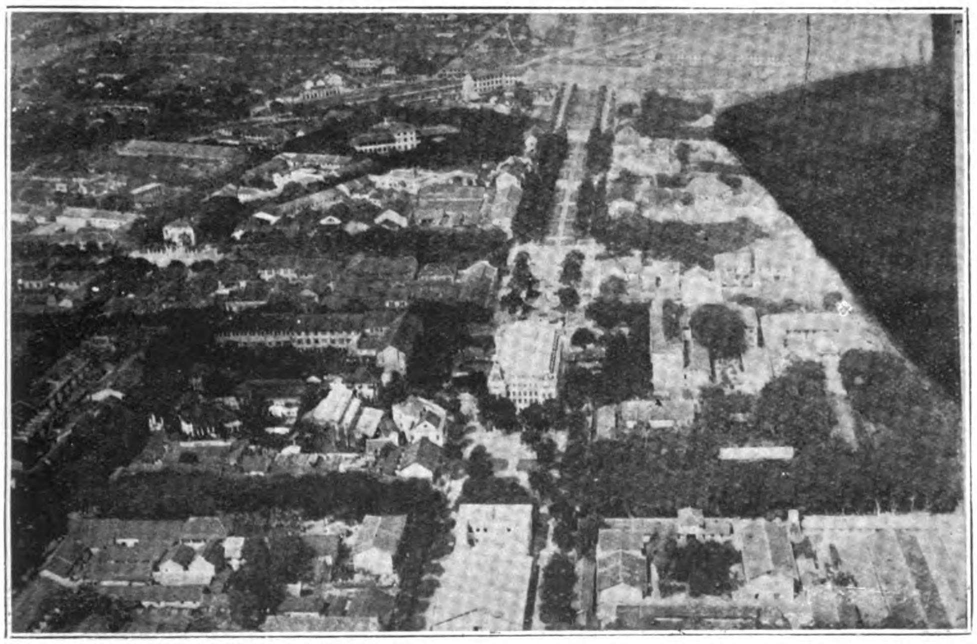
facturé, with a capital of 400,000 frs., has been established and manufactures most of the usual rubber articles, such as, bandages, belting and tubes of all sizes, etc.

Oil presses and soap works with modern appliances treat copra, ground nuts and various oleaginous seeds, such as, sasame, cotton, kapok and hevea. One mill of 60 h.p. founded by an Annamite, handles from 25 to 30 tons of raw material per day.

Besides the primitive native sugar-mills, two quite up-to-date modern ones have been opened.

Mechanical Industries.—Mechanical workshops with modern tools are in full activity, of which mention may be made of the Société des Forges, Ateliers et Chantiers d'Indochine with a capital of 3 million francs and of the Société d'Oxygène et d'Acétylene d'Extrême-Oriént, also with a capital of 3 million francs. The arsenal of Saigon, which played an important rôle in educating skilled labor in Cochin-China, undertakes the repairing of ships and has just successfully completed the construction of the *Albert Sarraut* a large cargo-boat of 3,100 tons burden.

The lower end of the Port of Saigon: showing the diversion canal recently cut through to Cholon



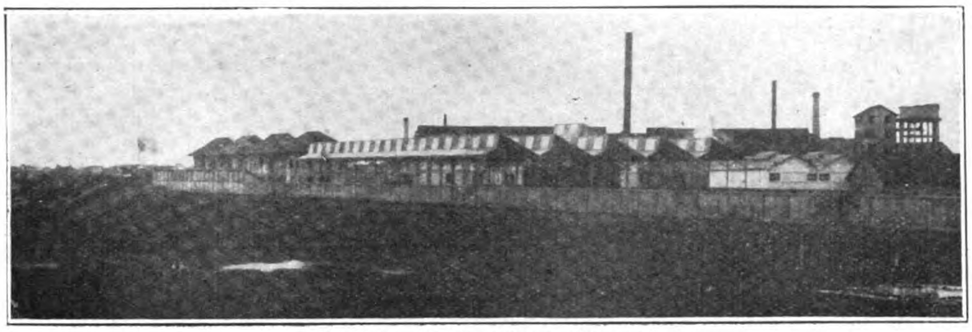
Beautiful Saigon, with its wide shaded streets and boulevards, handsome public buildings, parks, and open air cafes has well earned its title of Little Paris

B. Industries in the Interior of Indo-China

In the interior, the Bienhoa Industrielle et Forestière, with a capital of 6 million francs, is

methodically working the immense forests, and supplies besides constructional timber, firewood and charcoal, products of distillation, such as, methylene, pitch liquid black, etc.

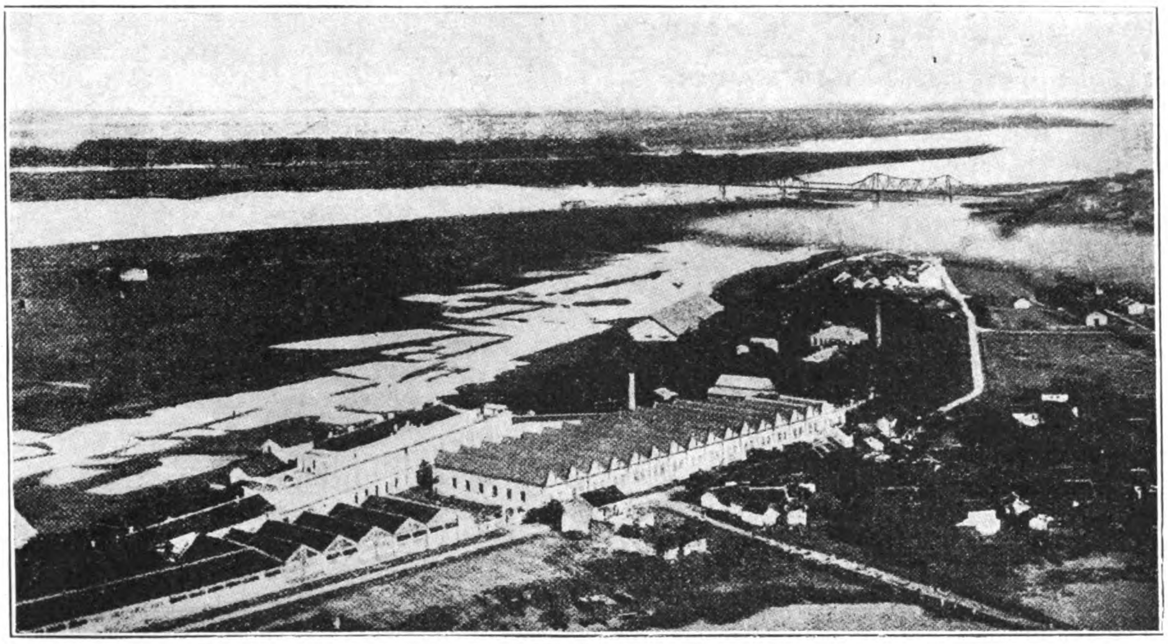
Finally numberless secondary industries are scattered about the country and contribute to its prosperity—saw-mills, brick-yards and dye-works, many of which belong to Annamites. Among the native industries those of weaving mats and silk-worm rearing may be mentioned, the latter especially.



A modern Rice Mill at Cholon

Annam

In Annam industries are connected chiefly with the forest trades and in North - Annam the trade in ironwood and other kinds of timber (either unhewn or in slabs) with Tonkin is very important. A few saw-mills and means for charcoal burning are to be found in this district, and there are two match factories at Thanh-hoa and Benthuy near Vinh.

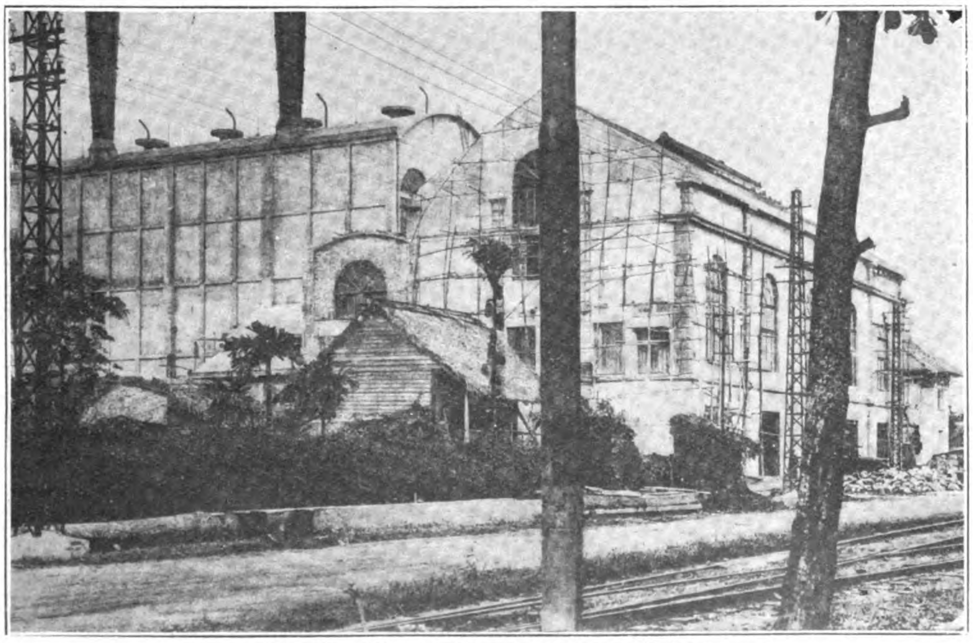


The Tobacco Factory at Hanoi

Messrs. A. Lapicque et Cie also have a meat - preserving establishment fitted up in the most improved manner, at Benthuy.

In Central Annam the Lang-Tho works near Hue manufacture various articles in cement and terracotta as well as enamelled ware and hydraulic lime of a yearly value of over 150,000 piastres.

The silk industry is increasing and besides the numerous native family workshops a French firm, Messrs. L. Delignon, have mills at Kwi-Nhon remarkably well fitted up.



The New Electric Power Station at Saigon

Tonkin

But the country of the union offering the best perspective of industrial development of its already important and varied industries is undoubtedly Tonkin, and this is due to its abundant and relatively robust labor and to the wealth of its subsoil, especially in coal. It may be noted that real strikes or even collective agitation amongst the workmen are so far almost unknown.

Difficulties in Colonial Business.—The field open to commercial enterprise in this colony is vast and important, but to those who might be tempted to settle in Indo-China as colonists or manufacturers by the glowing picture which we are about to present we would first offer a word of warning on matters which, though simple and well-known to old colonists, have often brought vexation, and even insuccess to the new-comer.

Situated in the tropics and inhabited by a race having its own ancient civilization so entirely different from ours, Indo-China presents serious difficulties which it would be eminently unwise to hide.

Both raw and secondary materials present serious differences from those growing in temperate countries, for the climate undoubtedly exercises an influence not only on the qualities of these materials but also on their finished product and even on their packing and on the extent to which they respectively support long sea voyages, etc.

Annamite labor, abundant in the deltas, is averse to working in the mountains where it is more susceptible than Europeans to catching fever. Annamites exhibit adaptability and skill of the highest order and are remarkably sober, but they possess the defects of their good qualities, skiful, they become jacks of all trades and masters of none, having few wants, they do not strive for high wages but are content to work just sufficiently to keep them going, further, most of the working-men are composed of peasants accustomed to return to their native village to help in gathering the rice harvest, all elements of instability, except among the really skilled men. This last defect is naturally not so notice-

able in factories established in the plains close to large towns, as it is in the more or less isolated mining centres in less healthy districts.

It is not surprising, therefore, to have sometimes to seek the solution of technical problems hitherto unsuspected or to be bitterly disappointed over such otherwise excellent labor.

Sometimes from lack of recognizing these difficulties natural to the countries, enterprises, in themselves excellent, have been grievously hindered through costly mistakes or even entirely stopped.

It need hardly be pointed out that the length of time taken in starting a new enterprise and the cost of the same is in indirect ratio to the experience of the person undertaking the same, for for want of valuable and numerous assistants (whose salaries are naturally high) the personality of the manager is generally of much greater importance in the Far East than is the case in Europe where a technical and commercial staff is easily found.

The Chief Industrial Centres of Tonkin.—Here owing to the facility of obtaining both raw materials and labor, industrial enterprises, other than those of mining and of metallurgy already described in a previous article, have grouped themselves in convenient centres, of which the chief are Haïphong, Hanoï, Nam-Dinh and Dapcau.

A.—Haiphong

Haïphong, thanks to its fluvial and maritime connections and to its proximity to the rich coal-fields of Hongay and the Dong-Trieu, has attracted the lion's share of the industries in question.

Here is to be found the splendid cement-works, known all over the Far East, founded by the Société des Ciments Portland Artificiels de l'Indo-chine, a limited liability company established in 1899 with a capital of 2 millions of francs and with a staff of over thirty Europeans and more than 7,000 Annamite workmen, which turns out yearly 150,000 tons of cement equal in quality to the best brands of Europe. These works will be shortly doubled by the addition of a 3,000 h.p. turbo-alternator and the construction along the river bank of a new works with all the most modern improvements.

At the other end of the town large chemical works have just been completed by the Société Industrielle de Chimie d'Extrême-Orient, having a capital of 11,250,000 francs when founded, but recently increased to 20 millions. These are run by electric power of 2,000 kw. and are at this moment turning out caustic soda, very rich chloride of lime, eau de javel (hyperchlorite and chloride of potassium) and sifted lime; shortly it will manufacture hydrogen gas, chloride of calcium and liquid carbonic, hydrochloric and sulphuric acids; later on, it is hoped chemical fertilizers will be made. The success of these works will be a feather in the cap of French colonization and should favorably react on new as well as on existing industries much hindered in their development by lack of chemicals.

Haiphong also possesses well equipped mechanical work-shops of which the two most important are: the Société de Constructions Mécaniques and the Ateliers Maritimes. The first named employs some from 350 to 400 workmen and manufactures marine boilers, steam engines (including a 550 h.p. triple-expansion engine) machinery for agriculture and mining and machine-tools. It also builds steam launches, tug-boats and wooden and steel barges and it is ever increasing its field of action. At the present time it is engaged in minting for the Tonkinese government and by means of the most modern machinery, copper sapeks which it is turning out at the rate of 17 millions pieces per month.

The Ateliers Maritimes, which have recently enlarged their works and now employ over 1,200 natives, undertake every sort of maritime construction and every variety of public works, such as bridge building, the making of reservoirs, etc. Their ship-yard has turned out numerous 120 to 150-ton barges and recently two big cargo-boats of 1,500 tons burden, the *Van Vollenhoren* and the *Fils Doumer* have been built. They undertook the building of the Bar-Thuong dam by means of compressed air, the construction of which will enable 173,000 acres of rice-fields in North-Annam to be irrigated.

In the same town are to be found the following works: those of the Société des Phosphates du Tonkin with a capital of 100,000 piastres which is gradually extending its sphere of usefulness and now has an annual output of 10,000 tons; works for making patent fuel and agglomerated blocks for building purposes; tile and brickworks with modern machinery; glass-works which had at first difficulty in obtaining fire-clay, but this has now been successfully got over; a cotton spinning mill employing about 900 Annamites and turning out native fabrics which are more and more appreciated; several rice-mills, one of which was erected by the Société des Rizeries Indo-chinoises (with a capital of 4 million francs) and is of 250 h.p. and employs over 300 workmen, being equipped in a very complete manner with modern machinery and capable of turning out 200 tons of rice of the first quality per 24 hours; an oil and soap works founded by a group of Indo-Chinese rice-mill owners and fitted to produce daily 20 tons of oil and 10 tons of soap extracted from coco-nuts, earth-nuts and cotton and castor oil seeds, which mill also distils turpentine and resin from the gum obtained by tapping pines and possesses other shops for similar products; and a small paint factory where bankul-nut oil, a siccative oil of the highest quality, is used.

To sum up, Haiphong is already a large industrial town with very varied activities and should ere long take a foremost place in this respect in the Far East.

B.—Hanoi

The Société Française des Distilleries d'Indo-chine has its offices at Hanoï. Established in 1901 as successors to Messrs. A. R. Fontaine et Cie, this company has increased its capital to 11 million francs and has the whole union as its field of operations. It actually owns three distilleries in Tonkin and one in Cochin-China, which are fitted to produce annually about 5,500,000 gallons of alcohol and are each equipped with ginning mills. The three works in Tonkin can handle 54,000 tons of paddy per year and that at Cholon in Cochin-China nearly 50,000 tons. The three works are of 1,000 h.p. in all.

This same Company has erected works for the preparation of new sorts of products from rice such as nitrogenized products, starch, glucose for confectionery and breweries, and denitrogenized rice also for breweries, and it is about to erect at Cholon a rice mill of 500,000 tons, as well as an oil-mill and works for the production of nitrogenized products.

The financial group of the Société des Distilleries de l'Indo-chine participates largely in other industrial companies, such as the Société Industrielle de Chimie d'Extreme-Orient, of which the splendid works at Haiphong have already been described, the Société des Anthracites du Tonkin, which works the collieries of Mao-Khe and of Trang-Bach, already described in the previous mining article. It is also interested in the growing and manufacture of tobacco in Tonkin.

The Société des Tabacs de l'Indo-chine with a capital of 6 million francs, employs some 700 persons and its productions, which it took a long time to bring to perfection, are now known all over the globe; it also sends tobacco leaves to the European market.

The Société des Tanneries d'Indo-chine merits special mention on account of the practical way in which it has adapted itself to local conditions, for it soon saw the necessity of a laboratory which it quickly set up and it is now continually benefitting by the results of the scientifically conducted investigations of the same.

The electric central station at Hanoï has been built by the Société Indo-chinoise d'Electricité (with a capital of 2,500,000 francs) and supplies Hanoï and Haiphong with D. C. for lighting and power, 2,500 h.p. at Hanoi and 1,200 h.p. at Haiphong. At Hanoi part of this current is transformed into A. C. for the wireless post of Bac-Mai close by.

Among other industrial enterprises the porcelain and fine pottery works of Hop-Loi may be mentioned. It is exclusively Annamite but fitted up on European lines and in spite of many primitive methods of manufacture it is continually improving the quantity and quality of its products, which are beginning to complete seriously with the ordinary porcelain imported from China and Japan.

We would also call attention to sundry brick-yards, one of which was started by an Annamite, to a brewery and to factories of buttons, cheddite and paint.

C.—Nam-Dinh.

Messrs. Emery et Tortel, now transformed into the Société Franco-Annamite Textile et d'Exportation, possesses here an important silk-throwing and weaving mill fitted with modern machinery.

The Société Cotonnière du Tonkin, with a capital of over 3 million francs, also have a very complete mill here, turning out

cotton of every kind from thread for the native weavers up to cotton goods for Europeans and including a whole intermediate series of goods for the Annamites and Chinese.

A distillery of the Société Française des Distilleries de l'Indo-chine, as well as a few other works, including brick and tile works, are also to be found at Nam-Dinh.

D.—DAP-CAU

The principal works here are those of the Société dee Papeteries de l'Indo-chine. This company, with a capital of 2½ million of francs, owns a paper pulp factory at Vietri on the banks of the Red river which utilizes almost exclusively bamboo for this purpose, this cane being floated down from the highlands of Tonkin where it grows in profusion. With a motive power of 350 h.p. these works consume monthly 1,200 tons of bamboo out of which 280 tons of paper pulp are made.

The paper-mill at Dap-Cau disposing of 500 h.p., turns out each month 190 tons of paper of over ten various kinds, from that used by the newspapers of Tonkin up to the best letter-paper. A monograph on the use of bamboo, rice straw, etc., for making paper-pulp has been issued by the Agence Economique de l'Indo-chine at Paris, and is full of interesting information.

E.—LA-PHO

Before closing this rapid survey of French efforts in Tonkin attention should be called to a very good example of the high degree of adaptibility and skill evinced by the Annamite workers when they are well taught and well treated, as shown by a new and special little industry requiring much intelligent observation on the part of the workers. This industry is that of the refining of lac carried on at La-Pho on the Black river, by Annamite men and women, who formerly after the gathering of the lac returned to their usual work. Their Hindu teachers, brought over at no little expense, and who for generations have practised this craft, were astonished to see how quickly their pupils learnt the trade which in India was supposed to require a long apprenticeship and much specialization.

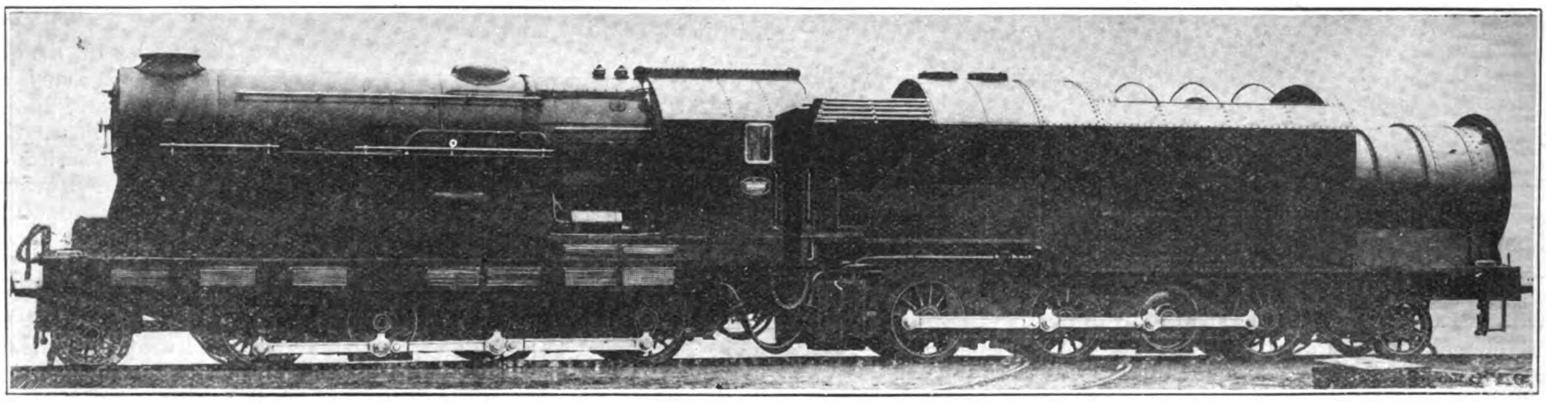
* * *

In conclusion a few words may be said about the innumerable small native handicrafts. Naturally clever the Annamite can make everything he requires in his own little workshop at home such as : lace, fine basket-work, mats and different articles in rushes, in rattan and in wood, turned or bent or lacquered, etc. Very interesting results may be obtained in this direction in either improving existing articles or starting new lines by European supervision, provided endless patience be shown and that skilled European workers be brought out to teach certain improved methods or manufacture and to correct the general want of finish which characterizes these native goods. The lace factories already started in Tonkin are a successful example of such co-ordination between East and West.

Among the small native industries weaving, and notably the weaving of silk, found all over the union, but more especially in Annam, Tonkin and Cambodia, forms the livelihood of numberless families and is increasing, the demand for such home-made fabrics being clearly greater than the supply.

In the big towns makers of boots, traveling trunks in wood or leather, furniture, etc., turn out their wares cheaply.

Finally, there remains a native industry which in spite of its primitive appliances turns out a product of high quality, that is the making of native paper from the bark of the cayjio (Rhamnoneuron Balansæ) the cultivation of which could be easily increased in the central districts. By the taking of a few precautions most beautiful paper, eminently suitable for artistic printing, could be obtained.



The Ramsay Condensing Locomotiv" Built by Sir W. G. Armstrong Whitworth & Co., Ltd.

A New Type of Locomotive

We give an illustration on this page of a locomotive of more than usual interest :—This type of engine was built by Sir W. G. Armstrong Whitworth & Co., Ltd., England, to the order of The Ramsay Condensing Locomotive Co., Ltd.

The following claims are made for this new type :—

A saving of 40 per cent. in coal consumption, over other types.

A still greater saving in water consumption.

An increase in power over corresponding modern locos.

Converting from high speed passenger to high speed goods loco. by a simple device.

As will be seen from the illustration, this locomotive is, in effect two separate units, which, coupled together, resemble to some extent the usual locomotive with its tender.

The front unit, with its boiler and frame, differs little from accepted practice, excepting that the cylinders and reciprocating parts are replaced by a turbo-generator of the impulse pressure compounded multi-stage type, connected with a three-phase generator. This generator supplies power to four three-phase motors arranged in two groups on the front and rear units of the locomotive. The power from these is transmitted through counter shafts to the six driving wheels on each unit, by the usual coupling rods. Each of these motors develops 275 h.p.

The rear unit incorporates a coal bunker and cooling water tank as well as a condenser and its appurtenances. This condenser is of the evaporating type, served with air from a fan at the rear of the engine.

In effect the Ramsay condensing locomotive is a self-contained power station on wheels—steam is passed through a turbine in which it does the work, and then into the condenser where it is reduced to water. This water is pumped into the boiler again for re-conversion into steam and so completes the cycle.

The great power of this condensing loco. appeals to railway engineers, owing to its much greater hauling capacity.

Increased power from the usual type of engine can only be got by increasing the dimensions, a course which is often rendered impracticable by limits imposed by tunnels, bridges, etc.

Hence two engines are often put to pull extra heavy loads. The Ramsay Co. claim that this new type will do twice the work of an ordinary engine and at a much lower cost.

The experimental model gave excellent results when tested on an English railway, a speed of 60 miles per hour being maintained over short runs with heavy loads.

Other new features in locomotive work adopted by the Armstong Co. (who only organized for locomotive manufacturing after the armistice), is that they now electrically weld boiler tubes to the tube plates, thereby avoiding possibility of leakage.

Minerals of Chinese Turkestan

IN recent report, H.M. consul-general of Kashgar, Mr. C. P. Skrine, gives some account of the mineral resources of this province. Southern Hsinkiang is exceptionally rich in valuable minerals and oil, none of which are exploited on modern lines and some not exploited at all. The following are worked in the order of their importance; Jade, gold, copper, oil, and coal. Other deposits which are known to exist, but which are not, so far as is known, worked at the present date, are: Silver, lead, iron, antimony, sulphur, and mica.

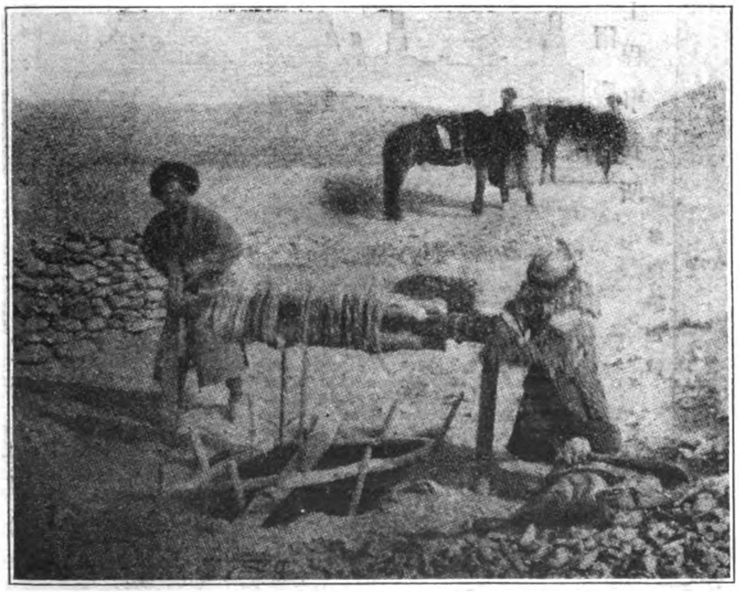
JADE.—Jade is found in the micaceous and hornblendic schists of the Kuen Lun Mountains, whence it is carried down in lumps and pebbles of varying size by the Karakash, Yurungkash, and Keriya rivers. The people of Khotan, Keriya, and neighboring villages recover the stone in considerable quantities from the river beds; formerly it was mined *in situ* at an almost inaccessible spot in the gorge of the Karakash south of Khotan, but the mine has not been worked for many years, and its very existence is now forgotten locally. There is no longer the free market for the product of the river beds that there used to be; most of it is taken up, at prices fixed by themselves, by the Chinese officials, and lumps of first-quality translucent green stone seldom or never come into the open market. The white and dull-green jades cost little in the uncarved state, the value being in the carving, which is done by artists at Peking. This work is not, and has never been, done at Khotan itself, where the stone is only worked into simple articles, such as beads, bangles, cups, etc.

Winnowing Gold in a Turkestan Mine.

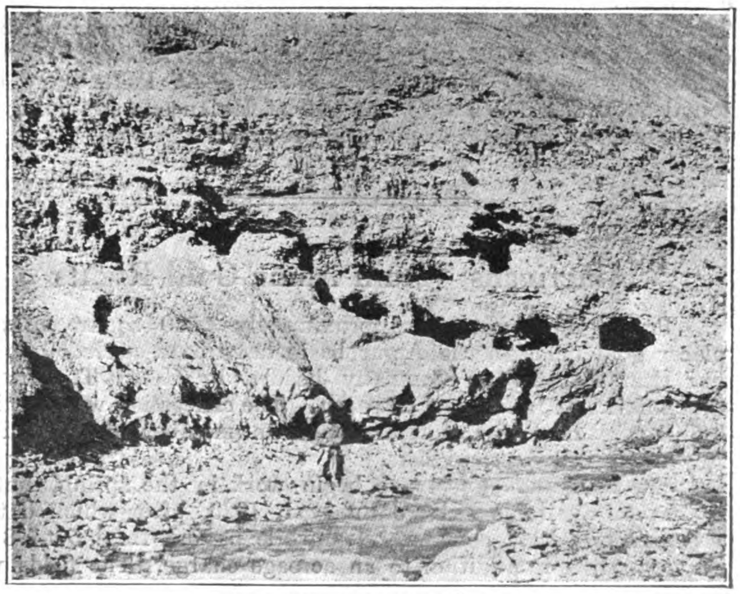
GOLD.—"Placer" gold workings of considerable importance exist at several places, notably at Surghak, on the Niya river, 45 miles east-south-east of Keriya, and at Kapa, 25 miles south of Keriya. There are also workings at Chugullak and Chapchand, in the same neighborhood—the high snowy range, part of the Kuen Lun system, at the foot of which these mines are situated, being known as the Altyn Tagh, or "Golden Mountains." The mines are exploited in a primitive manner by the Chinese officials through local contractors, who slave-drive the miners to such an extent that being sent to work in the gold mines is a common form of punishment for criminals in the Khotan and Keriya districts. The Chinese frequently have trouble with the contractor, and the output varies accordingly; in a good year as much as 900-lb. of gold is produced by an average of 2,000 miners. Nuggets of a lb. or more are frequently found. Gold "placers" are also worked at an extremely lonely and desert place called Ak-tagh, in the Karakoram, eight days' march south of Yarkand. This place is so inaccessible that it can only be worked for two months in the early summer, after the snow has melted and before the summer floods have reached their height, and then the miners have to bring all their food and firewood with them. Owing to the lack of pumping plant, the output of these workings, which are continually being flooded, is small, but the gold-sand is very rich, and, if worked properly, would yield large profits. There are also undoubtedly gold deposits in other parts of the mountains to the south of Yarkand, but the people keep them secret in order to prevent the Chinese starting mines and forcing the local people to work in them.

COPPER.—Extremely rich deposits of red, black, and green copper ores, from which pure metallic copper is produced by one smelting only, exist on the Terek river, in the foothills of the T'ien Shan to the north of Kashgar, and at Kanjigan, west-north-west of Kashgar. The "mines" are mere scratchings, as the Chinese who exploit them do not know how to carry their shafts to any depth, but even so about 40,000-lb. of the metal are produced annually, and made into all kinds of utensils for the local market. Copper is also worked at Onbash, on the Muzart river, 70 miles north-east of Aksu, while the ore is found near Kokya, on the Yarkand-Ladakh road, and in the Alai Mountains, to the west of Kashgar. No one in Kashgaria has any idea of how to refine copper chemically.

OIL.—The "Ferghana series" of oil-bearing strata extends into Kashgaria through Kanjigan, along the foot of the T'ien Shan, past Aksu, and right up to Kuchar. The chief wells worked by the Chinese are at Kanjigan, Aksu, and Kuchar; boring and chemical



Working Gold Mines at Sorghack



Gold Pits in Zailik Gorge

refining are alike unknown, the crude oil being scooped out of surface wells and holes. Even so, the strata are so rich that gasoline, kerosene, machine oil, grease, and mineral wax (ozokerit) of tolerable quality are all produced by means of primitive plant, and used freely in the chief towns. Here again the exploitation and manufacture, such as they are, are kept carefully in their own hands by the Chinese. The chief refineries are those worked at Kashgar by the Titai (general officer commanding, Kashgaria), and at Aksu by the magistrate.

COAL of fair quality, rich in coke, is found at Kanjigan, where shallow and primitive mines are worked by the Chinese. As only outcrops and weathered layers are mined, the coal is full of ash, and is unsatisfactory for domestic use ; but it would make an admirable fuel for metallurgical purposes. Coal exists at many other places in the province, but the only other mines worth mentioning in the southern part are near Aksu, and in the Karatash valley, south of Yangi Hissar.

Besides the above minerals, the following are worked by the local Turkis, and are always to be found in the bazaars : Ozokerit (found in natural state near Kuchar and south of Yarkand ; used extensively for candles), alum, salammoniac, gypsum. Good-quality fireclay is found in the carboniferous strata, and is extensively used by the natives in their smelting operations ; it will be invaluable it and when the mineral resources of this country are ever properly worked. At present the one idea of the local Chinese authorities seems to be to keep foreign enterprise out, and exploit the minerals of the province for their own sole benefit.

Electrical Development in Manchuria

(*Continued from page 82*).

and pumps, Cochrane feed water heaters and the other specialties sold by this concern.

KIRIN.—Aside from the plants in Harbin and the capital city of the province, there are several small plants scattered throughout the province of Kirin. At Yenki, a Chinese company with a capital of $100,000 operates a 60 k.w. plant : at Suiyuan there is another company capitalised at $200,000 operating a 100 k.w. plant : at Suifenho is a plant with a capacity of 14,000 lamps of which 2,667 are in use : at Pien Nien-tze west of Harbin, is another plant operated by a company with $100,000 capital having a lamp capacity of 2,000 and equipped with Japanese machinery made in Osaka : at Shwangchen-tze is another plant with a lamp capacity of 14,000 and at Imienpo one with a capacity of 3,000 lamps owned by Russians. A company to operate a plant to be erected in Siaoshihtzekai in Kirin province has been promoted with a capital of $50,000.

HEILUNGKIANG.—In Heilungkiang province there is a 144 k.w. plant at the provincial capital of Tsitsihar owned by a Chinese company capitalized at $100,000 supplying over 11,000 lamps ; at Taheiho, near Aigun on the Amur river, is a plant operated by a company with $300,000 capital supplying curent for 3,000 lamps for public lighting and power for saw-mills. At Pehtwanlintze is found another 3,000 lamp plant and at Hulan one supplying 700 lamps and run by a gas engine and producer.

Americans Obtain Amur Gold Rights

Prospecting rights in approximately 3,500 square miles of placer gold fields in the Amur basin have been conceded to the Far East Exploration Company headed by Henry T. Hunt of Cincinnati says, a Moscow dispatch. The concession was obtained by Charles H. Smith, former American member of the Chinese Eastern Railway commission.

The company expects to begin work in the spring, but its rights are available until January 1, 1925, after which date it must make a final contract, meanwhile paying from 5 to 8 per cent. royalties in addition to an acreage charge. The fields were last worked in 1915.

CONCRETE BUILDING BRICK

The above machine manufactures ORNAMENTAL FACE BRICK in many designs and colors. Makes ten bricks in single operation.

The machine, process of applying facing to brick and composition of facing, is patented.

Inquiries are solicited from reliable and well-financed business men for complete patent rights in their country.

WERT CONCRETE MACHINE COMPANY

Kendallville, Ind., U.S.A.

SULZER BROTHERS

SHANGHAI ENGINEERING OFFICE

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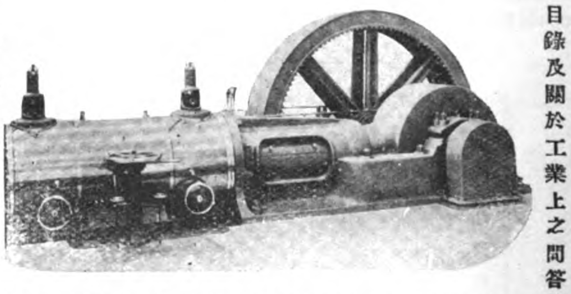

Sulzer Uniflow Steam Engines for Mill Driving producing from 100 to 3,000 H.P. in one Cylinder guaranteed coal consumption for complete plant (with Sulzer Upright Watertube Boiler) from 1.5 to 1.2 lbs. per I.H.P. per hour, with coal of about 12,000 B.T.U. per lb.

UNIFLOW STEAM ENGINES, Upright Watertube Boilers, High and Lowlift Contrifugal Pumps, Fans and Ventilators for all purposes, Fire Engines, Stationary Diesel Engines, Direct Reversible Diesel Marine Engines, Ice and Refrigerating Plants, Electro-Boilers, Maag Gear Machines.

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

遠東時報

上海仁記路第五號

A SUPER-EXTRA TERRITORIAL AMERICAN GOVERNMENT IN CHINA

AGAIN, THAT SUPERFLUOUS STATE DEPARTMENT
ANGLO-AMERICAN CO-OPERATION
JAPAN'S MESSAGE TO CHINA
JAPAN'S NAVAL POLICY

DEVELOPMENTS IN THE FAR EASTERN STEEL INDUSTRY
IRON ORE IN THE N.E.I.
PETROLEUM IN THE N.E.I.
MINERAL RESOURCES OF THE ALTAIS
THE CHINESE EASTERN RAILWAY ZONE

Vol. XX | March, 1924 | No. 3

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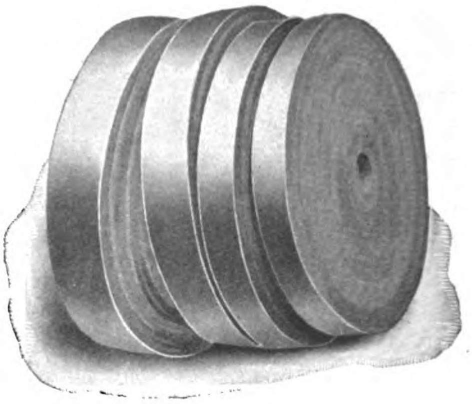

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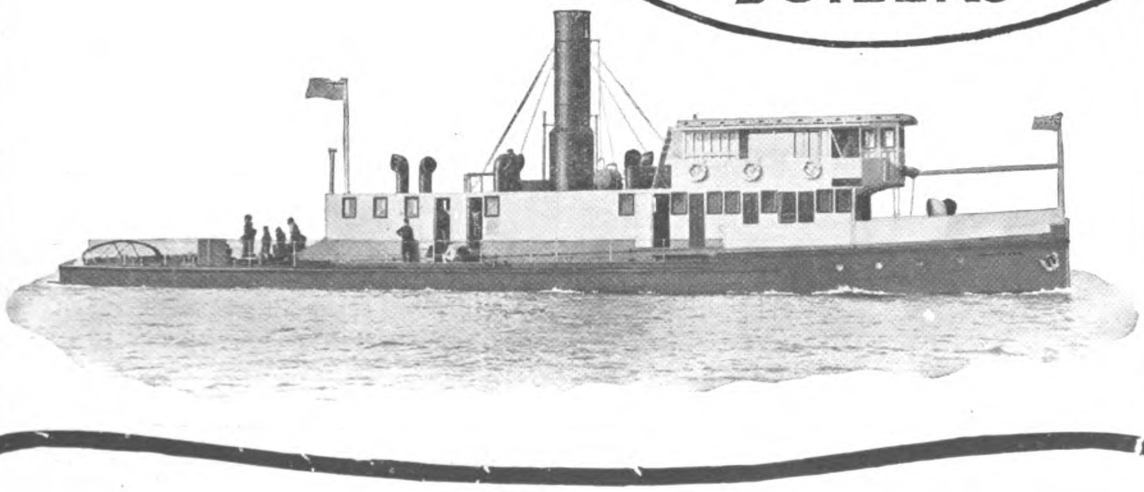


The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, MARCH, 1924 No. 3

A Super-Extra-Territorial American Government in China

The Menace To Peace in the Pacific

An Astounding Revelation

By Geo. Bronson Rea

Foreword: Is there an invisible American government in China? That such an organization exists and functions is admitted by its secretary. Our personal experience is sufficient proof that this inside group is capable of employing unethical methods to destroy the usefulness of those who oppose its policies.

For the past four years this magazine has been subjected to a merciless persecution. During the war while its publisher was in the army it was placed on the American black-list because it was said to have "sold out to the British." After the war a secret boycott was declared against it, because it was alleged to have "sold out to Japan." Confidential pamphlets calculated to destroy its circulation were mailed to all subscribers. False and libellous statements were printed with the object of discrediting its publisher. For two years our name was erased from the mailing list of the American chamber of commerce, notwithstanding that we were a charter member and paid its secretary for the first two years of its existence. We were served with a libel suit on the flimsiest pretext and for damages nicely calculated to compel a sale of the publication if the judgement went against us. After explaining our position before an executive session of the American Chamber of Commerce and producing documentary proofs to support our statements, we were again threatened with a libel suit by a British subject, through the same law firm. In fact, nothing was left undone to destroy the business of this magazine.

All investigations to ascertain the identity of our persecutors lead straight to a small group who form what might be termed an invisible government, with one of the cabinet profiting through our misfortunes.

We abhor anything which looks like a newspaper fight, but the assumption by an American editor of administrative duties and his efforts to decentralize American governmental authority in China in order to strengthen the powers of the group of which he is the official spokesman, leaves us no option.

Journalism has its ethics as well as other professions. The higher code debars an editor from occupying public positions which in any way interfere with his liberty of criticism. A similar code prohibits an official from using his position to destroy the usefulness of a competitor for the benefit of his own enterprises. Yet for the last five years THE FAR EASTERN REVIEW has been compelled to submit to such practices. We have been brought to the bar of justice on the flimsiest pretext and sued for damages which represented the full value of our property at that time, and the case against us was prosecuted by the principal shareholder in a competitive newspaper which stood to profit by our misfortunes.

It has been a screaming joke on us for over five years; in the following articles we return the compliment.

FOR a long time the existence of a super-extra-territorial American government in China has been suspected by those upon whom its secret mandates have been enforced. The working of this organization has been felt not only throughout China but in the home press, in the halls of congress, in the state, war, navy, justice and commerce departments at Washington and at times even in the executive mansion. As it stands, Americans in China are singularly blessed with all the legal machinery of government. There is a minister at Peking and consular officials throughout the country to protect their interests under the direction of the department authorized to conduct our foreign relations and enforce the treaties. There is a commercial attaché at Peking with wide powers. Under him are a trade commissioner and a registrar of China trade act companies in Shanghai. This useful organization reports direct to the department of commerce at Washington. There is a United States court for China sitting at Shanghai with its judge, commissioner, district attorney, marshal and clerk. An independent army command is stationed in North China under a brigadier-general acknowledging the direction of the secretary of war. In addition, there are the legation guards under command of a colonel of marines reporting to the navy department. A unit of our Asiatic fleet, known as the Yangtze patrol, is commanded by a rear-admiral directly responsible to the secretary of the navy through the commander-in-chief of the

station. There is a special representative of the U. S. shipping board with offices at Shanghai operating independently of other departments. The treasury department has an agent on the ground for its own special reasons. There are agents of the department of agriculture scouring China for seeds, plants, bugs and nuts to add to the choice and varigated assortment now found at home. There is a bill before congress to transfer the U. S. court for China from the jurisdiction of the state department and place it under the department of justice, thus creating another water-tight department in China. In fact, as we have several times noted, Americans in China enjoy all the benefits of their democratic institutions except the fundamentals—the right to vote or to be tried by a jury. The machinery of the federal government has been transplanted to China and all that appears to be lacking is co-ordination of the various departments under one executive head.

Now it is manifestly against the rules of the game for the administration at Washington to direct the activities of a quasi-colonial service operating within the confines of another state whose sovereignty over foreigners has been impaired and almost wiped out by treaties and extra-territorial concessions. It was also manifestly impracticable for the president to appoint an extra-territorial governor-general to preside over the American colony in China without committing a breach of international decorum, so the situation has been met and surmounted by the creation of a super-government which operates officiously from a headquarters at Shanghai. This secret conclave devises policies, declares boycotts, and passes resolutions which are cabled through inside publicity channels to the American press or transmitted by mail over the heads of the legally constituted authorities to the government at Washington.

The existence of this extra-territorial government has long been felt by expert observers but because of its picayune and inquisitorial methods, powerful influence over legally appointed officials, an interlocking supervision over all American organizations in China, control over so-called newspaper exponents of American opinion and semi-official ramifications in other government activities, it has been not only difficult but extremely dangerous to condemn its workings without inviting penalties from which for a long time there was no redress.

We are, however, at last permitted to speak with accuracy and invite attention to the operation of this American colonial government in China. *The Nation's Business*, official organ of the United States chamber of commerce, in its February number, prints an article entitled "The Troubles of a Chamber in China" contributed by Mr. J. B. Powell, in his capacity as secretary of the American chamber of commerce of China. Mr. Powell speaks with authority and it is to be assumed with the full approval and consent of the directorate of which he is an extremely useful and active member. At the close of a rather colorful account of the troubles of the chamber over which he exercises secretarial functions, he makes the following astounding revelation :—

"Our problems here are much diversified, owing to the peculiar international situation and many of these problems are aggravated because of the weakness of the Chinese central government. When China finally develops a stable government many of the semi-governmental and administrative functions of our chamber will be taken over by the organs of the Chinese government as is the custom in other sovereign lands."

Exactly. We have here an official confession that a group of Americans in China has arrogated to itself the administrative functions of government, usurping the prerogatives of the duly constituted and appointed American authorities provided for by the

(From The Manila Bulletin)

U.S.-JAPANESE LOAN RUMORS WORRY CHINA

Fears $50,000,000 For Rehabilitation Will Be Mishandled by Tokyo

"MAILED FIST" THREAT

Believes Japan Plans to Strengthen Control on Republic

By J. B. POWELL.

(Chicago Tribune Exclusive Service)

SHANGHAI, February 3.—Press advices here from New York city and Tokio to the effect that American bankers are lending Japan $50,000,000 for rehabilitation are causing apprehension in Chinese financial circles, owing to reports from Japanese financiers that it is the intention of the Japanese to use a great part of the money for clinching Japan's control of China, especially in the cotton industry, instead of using it for the announced purpose of restoring Japan after the quake and fire of September 1.

Americans Apprehensive

The American chambers of commerce here also are apprehensive as shown by a resolution of the American chamber of commerce of Harbin several months ago, expressing fear of American money coming into China through Japanese hands which might result in the undoing of the work of the Washington conference.

The Associated American chambers of commerce of China in the annual meeting in 1922 passed a resolution, saying in part :

"It is essential from the American national standpoint that American capital should come into China through American agencies, thus preserving our individuality and contact with China and the Chinese people which is necessary to the future peace and prosperity of the two peoples."

Open Door Threatened

Americans, interested in the commercial development of China and who have worked years to open China to American commerce, are frankly apprehensive that unrestricted use of American capital in China under Japanese control and through Japanese agencies would have the general effect of undermining American business in China and undoing long established American policies of the open door and territorial and administrative integrity of the Chinese republic as covered in the nine-power treaty adopted at the Washington conference.

Americans interested in the development of American business in China naturally have no objections to American loans to Japan but believe that the state department should obtain guarantees that the money is not to be used in China in enterprises detrimental, either to American business or to long established American policies, respecting China, otherwise they may have serious international complications in the future.

treaties. The following paragraph from this most interesting and enlightening document supplements the above :—

"It used to be our practice, when some special problem developed affecting American trade or interests out here, for a body of Americans to get together and draft some kind of resolution or protest or approval and hand it to our local American consular official with instructions for cabling to the department involved. We have discovered that we get better action when we also ask the national chamber of commerce to take up the matter personally with the government."

If further evidence be needed of a determination to direct the policies of the nation against the dictates of the government, it is only necessary to refer to the set of resolutions passed by the associated American chambers of commerce at their last annual meeting. These resolutions decided to supplement the usual methods of communicating with the government at Washington through its duly appointed representatives and in its stead create an independent diplomatic service of its own by the appointment of a special delegate to reside at Washington and enlist the aid of the chamber of commerce of the United States, government officials and departments, commercial and other organizations interested in the various subjects referred to him for attention. The resolution went on to say :

"Owing to the fact that foreign trade occupies such a small portion of the interest or activities of the American people generally, it is always difficult to induce the American government to adopt constructive and continuing policies in foreign affairs and especially in respect to American interests in this part of the world. The lack of familiarity on the part of many of the officials at Washington in respect to the protection of the lives and property of its own citizens not to mention the larger diplomatic and strategic interests of America in the Far East has made it necessary for American citizens both individually and through their organizations to frequently conduct publicity campaigns in the United States. Such publicity campaigns in the past, although largely unorganized, have nevertheless been of considerable benefit in concentrating the attention of the American people and through them of the government upon particular problems affecting the interests of Americans in this part of the world.

"In view of the serious situation now existing in China which constitute a menace to the lives and interests of American citizens residing in the Chinese republic, it is recommended that the associated American chambers of commerce of China give this subject special attention and that a special committee be appointed to work out in co-operation with other American organizations, a definite publicity campaign calculated to bring to the attention of the American people, members of congress and other officials of our government the necessity of a definite policy in respect to the present situation of China."

In our last November number, under the caption of a "Superfluous State Department" we commented upon this usurpation of governmental functions and emphasized how a campaign to educate the American people to their larger diplomatic and strategic interests in the Far East under such direction might easily conflict with the policies and program of the state department and precipitate a "show-down" in our relations with some friendly power.

If it was not for the danger arising from the operation of a self-constituted super-government holding views diametrically opposed to the policies of its home administration its existence would be considered a huge joke and the pretensions of its leaders a matter for the comic newspapers. But the danger exists and cannot be lightly set aside if good-will and peace are to follow the Washington treaties. Mr. David Lloyd George looking ahead to the next appalling world war says that the only salvation for civilization lays in assiduously cultivating good-will between the nations. "Peace is only possible" he says, "when you introduce into the attitude of nations towards each other principles which govern the demeanor of decent people towards their neighbors. The men who are always sowing distrust and dislike of men of other races and lands should be picked out, condemned, shown up, hunted by the scorn, the contempt and the wrath of their fellowmen." The great Welshman is right. One menace to world peace lies in the persistent efforts of a group of bigots to keep alive the fires of resentment against Japan at a time when the best intellects are striving to find a harmonious solution to Pacific problems.

At the head of this group in China stands the editor of *Millard's Review*, now known as the *China Weekly Review*. We could cite innumerable instances and quote from many articles and documents to support the statement that Mr. J. B. Powell, as secretary of the American chamber of commerce of China, has employed this position to give force to his anti-Japanese proclivities. There exists ample evidence that the driving power behind this director of American activities in China is an intense hatred of Japan. It is important, therefore, for Americans concerned with the establishment of peace in the Pacific to fathom Mr. Powell's mind, to discover his basic ideas with regard to China, to understand his psychological reaction to the events of the day. In the first place, every country has its "Little Englanders," those provincial human beings who sincerely believe, "My country right or wrong," who refuse to understand the other man's point of view and who hit at everybody else not because the other fellow is wrong but because they are so patriotic as to be lop-sided. Mr. Powell's patriotism moves in that direction. He not only sees "America first," but "*America uber alles*," an epigram which cost Germany the friendship of the world. This, then, is not a matter of good-will but one of judgement. An individual so nationally-minded that he forgets there are other people on the face of the earth naturally cannot give a square deal to other people. America stands for a square deal. It does not want to build itself up by taking advantage of anyone. Mr. Powell, in constantly attacking other nations is not taking the American point of view. He is taking a point of view which he as well as other Americans deprecate in other nationalities. He and others call it imperialism when the phenomena appears in Japan or Britain. They call it patriotism when they practice it themselves. Those who hold opposition views are called traitors.

With regard to Japan, Mr. Powell's position is hopeless. He hates Japan. He can see nothing good in Japan. Even the terrible disasters of the earthquake awakened no chords of sympathy in him. He sought for evil conduct even there and his publication gave space to stories about atrocities and misconduct, while the rest of the world was aroused to sentiments of pity and friendship for a great nation in distress. While the people of the United States were responding to appeals for help with a big-heartedness that knows no nationality, he was worrying over the suppression of a news story—something which all governments do in time of national calamity. When Japan was negotiating her reconstruction loan in the United States Mr. Powell sent a wire to the *Chicago Tribune* which was published in the *Manila Bulletin*, one of the newspapers included in his special news service from this country. The working of his mind and methods and how he utilizes the invisible government of which he is the secretarial head to give force to his propaganda is laid bare in the news dispatch appearing in the centre of the previous page.

The approval of the state department to the loan means nothing to Mr. Powell. The state department is quite incapable of conducting the foreign relations of the nation from the viewpoint of his group. See how delftly he drags in the American chambers of commerce to support his utterly gratuitous slap at Japan and by inference the ability of the state department and our financiers to look after the higher interests of the nation. Note how insiduously the idea is injected into the mind of the reader that this wholly friendly and humanitarian loan will result in the undoing of the Washington conference. Note how the resolution of the American chamber of commerce of Harbin against the floating of the National City Bank loan to the Japanese Oriental Development Company is lugged in to give force to his statement. The hong list is proof that the American chamber of commerce at Harbin is composed in large part of firms whose managers, sub-managers and employees bear Russian names. The whole argument is typically anti-Japanese, intended to kill the reconstruction loan before it was offered to the public.

Had Mr. Powell written his cable in 1919 or 1920, there would be little gainsaying his statement that Chinese were opposed to it. But a careful survey of Chinese opinion, particularly financial opinion, indicates a complete indifference to the loan.

What is most surprising, however, is that the state department has not worried about these stories, that it has not feared Japan's clinching its hold on China's cotton industry and that the big American financial interests which are naturally more concerned with America's position in China than Mr. Powell, would strongly favor the loan and not worry about its uses in China. Furthermore, a similar loan was taken up by British banks and everyone who knows of economic conditions in China knows that the textile situation is one of Britain's fondest interests in this country. Yet, they were not concerned.

It will be readily seen from this one example that Mr. Powells' attacks upon Japan are merely the manifestations of a one-track mind, a hold-over from the war period when he and his colleague dominated American opinion in China through a newspaper which was accepted as the official organ of the American chamber of

commerce. Baiting Japan was then the fashion. The head-baiters were placed in high positions and it was easy for the little fellows to follow along and swell the ululations of the pack with the volume of their snarls and growls. As Lloyd George says of the anti-Semitic: "those who indulge in Jew-baiting would be the first to run away were there any element of danger in it. Jew-baiters are generally of the type that found good reasons for evading military service when their own country was in danger." We have noticed the same phenomena in the rank and file of the Japan-baiters.

Serious as these attacks upon Japan are, even more serious and dangerous to the preservation of peace and good-will in the Pacific are the semi-governmental and administrative activities of a group which includes in its membership such prominent Japan baiters as Mr. J. B. Powell. Exactly what are these semi-governmental and administrative functions of the American chamber of commerce of China? By what authority does the chamber function semi-governmentally? Does the president of the United States know about this? Does the department of state know about this? Has the United States District Attorney investigated this usurpation of governmental powers? Is the Chinese government aware that its weakness is being used to further impair its authority? Is it aware that above the regularly accredited representatives of the American government in China there has been created an organization which is taking advantage of its impotence to usurp its functions? There would seem to be no other interpretation to the confession of Mr. Powell. Here is a matter which the executive committee of the American chamber of commerce should clear up, and at once, so that Americans in China may know where they stand.

There is much also in the interpretation of this paragraph that Americans should be informed of without delay. For instance, when an American in China is in difficulties should he apply to his minister, his consul, or to the American chamber of commerce? When there is a trade-mark violation, illegal taxation, banditry outrage, need of protection, default on a loan or refusal to pay a government obligation, or any of the thousand and one questions which constantly arise, should he apply to the regularly appointed American officials or to the super-secretary of the American chamber of commerce?

Are we to accept the conclusion that the entire matter is a farce, or, an assumption of authority where legally there is none, a meddling in affairs where constituted authorities are provided? All this gives to foreigners an impression of disorganization of authority actually not existent and gives to certain individuals a false sense of their own importance which not only seriously menaces their usefulness but makes for friction at a time when the first duty of every clear-headed citizen of all nations is the cultivation of international good-will. As a writer in the *New York Commercial* puts it:

"Those vociferous folk in Manila, Shanghai and other parts of Asia, who identify American business with slaps at the Japanese, and guffaws and swear-words at the long suffering Chinese, have outlived their usefulness. They are not popular in the capital of the nation, or in New York, the capital of the nation's business."

Is it not time that Americans asked where all this is leading to? May not the time arrive when the Chinese government may demand through the regular diplomatic channels a fuller explanation as to just what the American chamber of commerce of China means by this frank admission of its honorary secretary? Would not the Japanese government be equally justified in inviting the attention of the Washington authorities to the existence of a super-administrative body operating from Shanghai which loses no opportunity through its secretary to question its good faith and stir up animosities? May not the time arrive when the government at Washington will become fed-up with these encroachments upon its authority, with these floutings of its policies, and take the necessary steps to stamp out this menace to its prestige and the perpetuation of friendly relations with Japan and China?

Mr. J. B. Powell has placed the American chamber of commerce in a most unenviable position.

Again, That Superfluous State Department

OUR criticism of the decision rendered by Commissioner Lurton of the U. S. court for China appearing in our February number is employed by *The China Press* to present the side of the court in terms which further strengthens the argument that the state department should be untrammelled in its conduct of our foreign relations. *The China Press* says:

"A monthly magazine has taken upon itself to criticise the decision, not because it may be legally wrong, but because it might lead to unfortunate developments in the diplomatic history of the Far East, involving the reopening of a large number of questions which had been regarded as effectively settled. *But we are of the opinion that the decision of the court deserves no such criticism, but rather praise as a ruling calculated to reaffirm the constitutional rights of American citizens as defined by treaties embodied in our law. The treaties of 1844 and 1858 having been ratified by congress became part of the law of the United States and no agreement between other countries can modify the privileges of our citizens without the consent of our legislature. It is consequently a matter of relatively small importance what interpretation the state department cares to put on the documents involved in this case.* Indeed, we have always understood that in various rulings secretaries of state have refused to pass on any question the answer to which might bring it into conflict with any tribunal, and the inference to be drawn from this is, that the state department itself desires the courts of the United States to be absolutely untrammeled by any political or diplomatic consideration.

"What the writer of the article in question apparently fails to perceive is that the duty of any court of justice is to administer the laws applicable within its jurisdiction and to suggest that such application should be subject to diplomatic expediency is to advance a proposition foreign to the spirit of any judicial process."

Quite right. The legal aspects of the decision are beyond our criticism. Our comment takes the form that it is manifestly injurious to the prestige of the American government for an official of a bureau under the direction of the state department to precipitate a delicate international issue without consulting beforehand with his superiors, especially when the decision reverses the established policy of the government, renders possible a readjustment of our foreign relations and says in effect, that the state department is incompetent to interpret the treaties. Rushing through such a decision and giving it out immediately for publication in the local press without reference to the position of the state department would seem to be the height of discourtesy, one that would not be tolerated in any other government or private business enterprise.

If it is a matter of relatively small importance what interpretation the state department cares to put on the documents involved in the Lurton decision, then its stand on other equally delicate international questions is also a matter of relatively small importance and opens the way for further impairments of its constitutional powers by other federal departments operating in China under treaty provisions which, in the last analysis, the state department is called upon to interpret and enforce. A bill is now before congress to have the U. S. court for China transferred from the jurisdiction of the state department to the department of justice. The bill has received the endorsement of the associated American chambers of commerce of China. The "American" newspapers reflecting the policies of this organization are very strong in support of the measure. Any scheme which undermines the authority of the state department by the independent operation of other American governmental departments in China tends to strengthen the authority of the invisible government in this country, and would naturally receive the approval of the editorial writer for *The China Press*.

Now, there would seem to have been no urgent judicial issue involved in raising the question of the court's jurisdiction over American citizens in the Kwantung leased territory, for, after rendering the decision, the accused was permitted to depart from the jurisdiction of the court without hindrance. It would seem that after setting aside the established policy of the government and precipitating the issue with Japan, the court should have as energetically

enforced its decision and remanded the accused for trial. As it stands, an international issue has been created without in any way advancing the ends of justice. When viewed from this angle, the decision can properly be interpreted as a wholly gratuitous slap at the state department—part of the campaign to have the court freed from its supervision.

Aside altogether from the embarrassment to the state department, the decision precipitated another major issue between China and Japan. As soon as the Chinese authorities learned of the decision and how it would bolster up their demand for the retrocession of Kwantung, the civil governor of Fengtien province, Mr. Wang Yung-kiang, sent a formal note to the Japanese authorities at Port Arthur demanding the immediate surrender of all Chinese criminals and, furthermore, stated that henceforth Chinese jurisdiction would be exercised over its nationals in the leased territory. It can be seen from this that the Chinese lost no time in hanging on to the coat-tails of Uncle Sam hoping that the Lurton decision would be enforced by Washington.

The Japanese foreign office flatly refused to consider the demand. When this reply was communicated to the Chinese authorities at Mukden by Mr. Funatsu, the Japanese consul-general, the Chinese side-stepped. It was all a mistake they said. The demand had been made without the knowledge or consent of the civil governor and transmitted by a subordinate official who had exceeded his authority. The note was withdrawn, but it is significant that the Chinese backed-down solely because it had been transmitted through irregular channels and not because they relinquished the point. They are now holding back, waiting to see what attitude the American government will take. If it should uphold the Lurton decision they will quickly re-open the question and lean on American diplomacy to pull them through.

As Japan refused to discuss her status in Manchuria and Kwantung before the Washington conference, so she rejected the Chinese demand. She will undoubtedly refuse to consider any re-opening of the question. The state department is fully aware of Japan's attitude, and we feel certain that had the decision been brought to its attention before being made public it would have found good legal reasons to defend an interpretation of the treaties which have been in force for the past twenty years. There is little chance of raising any serious issue between the Japanese and American governments over this decision but on the other hand it might, by misleading the Chinese, influence the latter to revive their demand at some future date.

The time is past when the people of the United States will consent to act as the special guardian of China and any move on the part of Americans which may be interpreted as an open espousal of her cause against Japan is to be strongly deprecated. As far as Japan is concerned, the Manchurian question was settled at Washington, but we can expect to find issue after issue created by the Chinese in order to keep alive the agitation against Japan. Coincident with the filing of the Chinese demand for jurisdiction over their nationals in the leased territory, Marshal Chang Tso-lin initiated another movement for the recovery of the Antung-Mukden section of the South Manchuria Railway. The demand will be based on clause six in the supplementary agreement to the sino-Japanese treaty of 1905 which says that at the end of fifteen years from the date of reconstruction of the Antung-Mukden Railway, each contracting party shall appoint an appraiser who shall proceed to a valuation of the line and its properties, and they shall be sold to China at the appraised price. This is merely another attempt to bring up the validity of the 1915 treaty in which Japan's control over the property was extended to 99 years. Reports from Manchuria state that the students are preparing for another campaign for the recovery of sovereign rights, etc. No matter what the merits of this dispute may be, it is clearly the duty of Americans, especially those in official positions, to refrain from any action which might be interpreted by the Chinese as a support of their tactics.

There can be little doubt that the Chinese seized upon the Lurton decision to further their own ends. If this was an isolated instance of intervention in diplomatic affairs by other federal departments it might be dismissed as of little consequence. It, however, follows other equally serious impairments of the state department's authority in China. Next to the "open door" doctrine the most important policy designed to enforce its provisions and eliminate the spheres of influence was the creation of the international financial consortium. The American government initiated the plan for this new combination, invited the other powers to join and employed the full weight of its prestige to push it through. Yet within a year the commercial attaché at Peking was making speeches before chambers of commerce at home attacking the consortium and advocating independent financial activities. The picture presented to the governments induced to surrender and pool their special interests and concessions in this new organization was not a pleasant one. In order to save the American government from the charge of double-crossing its partners, the state department in this instance asserted its authority and put a stop to further attacks upon the consortium by officials of other departments.

On a par with such activities stands the resolutions calling for intervention passed last year by the super-extra-territorial American government of China, without consultation with the properly constituted authorities or without reference to the general wishes of Americans. The major commercial and philanthropic American interests in China are placed in jeopardy for a policy neither they or the Washington government had any share in fashioning. Had the official representatives of the American government been invited to take part in the discussions leading up to these resolutions many of their objectionable features would have been eliminated. Had even some legal expert been consulted, the committee would have been convinced of the mistake of meddling in matters which exposed it to the criticism of not knowing what it was talking about.

The effect of these resolutions has been to create deep distrust of American policies in China and hamper the state department, legation and consulates in carrying out the real policy and program of the government. We cannot have one government at Washington and a group of citizens in Shanghai exercising semi-governmental and administrative functions and passing resolutions which nullify the real policies of the nation. Neither can we have officials of other federal departments functioning in China independently of the state department without inviting similar clashes of authority.

We are of the firm opinion that friendly relations between Japan, China and America can best be maintained by the department authorized by our laws to supervise and direct them. We are unalterably opposed to any modification of these basic laws that will permit another department to intervene and nullify its duties. If a super-extra-territorial government exercising administrative and semi-governmental powers is to exist in China in conjunction with other federal departments operating independently of the state department and are encouraged to incite race hatreds and precipitate dangerous international incidents, then Americans may as well prepare for the worst. G. B. R.

Anglo-American Co-operation

A $150,000 Joke at our Expense

THE longer one stays in China the more he is impressed with the necessity of preserving a sense of humor if he is to retain a proper perspective on the march of events. At a dinner given recently by Mr. H. E. Arnhold (chairman of the British chamber of commerce at Shanghai) to his associates, he took occasion to emphasize the necessity for Anglo-American co-operation because " it will always be difficult to achieve anything out here if we are to be dependent upon unanimity among twelve or more powers. If, however, the two English-speaking races co-operate, the other powers, in most cases, will fall in line." "The Americans," he added, "have done everything they could during the past year to show us that they wish to co-operate with us, a spirit which has not been confined to

the chambers of commerce but has been seen in the discussions of consular officials."

Mr. Arnhold was evidently so deeply interested in his subject and so impressed with the American desire to join hands with the British that he for once lost sight of facts, which had he known, would have tickled his keen sense of an enjoyable situation. He would have seen that those Americans with whom he had been in contact were the same gentlemen conspicuous only three years ago in defeating this coming together of the two great English-speaking peoples. At that time any deluded American who openly allied himself with British interests was a "traitor" to his country, an object of suspicion, a man to be ostracized and boycotted by all good patriots.

Time, however, works wonderful changes. The man who was a "traitor" yesterday becomes a patriotic leader to-morrow and the patriots of yesterday are the "traitors" of to-day. Three years roll by and we find the same group of Americans who denounced and persecuted their countrymen for co-operating with the British now leading the procession shouting for the doctrine they so bitterly condemned when practiced by others. There must be some excellent reason for their conversion. So we are tempted to tell a funny story.

THE FAR EASTERN REVIEW is and always has been a strong advocate of Anglo-American co-operation. In fact, it was a pioneer in the movement, one of the first to apply and carry it out in practice. Long before such co-operation was dreamed of by others we accepted the principle as a guide for our own activities and in doing so fashioned a club that was subsequently employed to kill our usefulness in this community. The public perhaps are not particularly interested in the troubles of a newspaper, but it is entitled to know the reasons why its publisher sees the comic side of a policy now endorsed by the combined American and British chambers of commerce.

When this magazine was started twenty years ago its publisher realized that the first requisite to success in this international field was fair play to all interests, irrespective of nationality. This basic rule applied with special force to the British whose capital and enterprise working hand in hand with an intelligent and fixed governmental policy had developed the then existing railways, mines and foreign industries in this country. As a result of this policy of fair-play, THE FAR EASTERN REVIEW received the hearty support of British financial, commercial and engineering firms many of whom have been advertising in its pages since the first year of publication. Even when, in our opinion, it was necessary to criticise British policy and methods, this friendly support was never withdrawn.

In carrying out our idea of Anglo-American co-operation the publisher of THE FAR EASTERN REVIEW engaged in 1911, a British editor, and gave him outright a substantial interest in the business. In effect, this magazine became an Anglo-American enterprise, an ideal business arrangement for any publication catering to the Far Eastern field. Under this direction its business ran along prosperously and smoothly until 1917, when America entered the great war. Its publisher, feeling that his interests were fully safeguarded by his British associate, joined the army and was sent to France. One of the first letters received from his American representative conveyed information that the agents of a new American weekly which had started publication in Shanghai shortly after America entered the war, was soliciting advertising from his clients on the ground that THE FAR EASTERN REVIEW was no longer an American publication, that its owner had sold out to the British and had left China for good, therefore it was the duty of American manufacturers to support a *bona-fide* American publication that would exclusively defend their interests.

A similar story was circulated throughout China at a time when hundreds of American firms were opening offices in this port. In due time it came to the ears of the acting American commercial attaché at Peking and without stopping to verify the rumor, this gentleman sat down and wrote an official report on the conduct of business with China in which he stated that THE FAR EASTERN REVIEW, formerly American owned, had passed under British control. This made the story official. It was published in a special commerce report and read by every American firm interested in Far Eastern trade. It placed THE FAR EASTERN REVIEW on the American black list and deprived us of any benefits in advertising business that followed the export boom.

Now, we have no legal evidence as to who originated a report obviously intended to injure us with American manufacturers, but we have absolute evidence of who spread it and profited by it. In commenting on the appearance of the first number of the *British Chamber of Commerce Journal*, the editor of *Millard's Review* at that time secretary of the American chamber of commerce, invited attention to the official report of the department of commerce regarding the British ownership of THE FAR EASTERN REVIEW and stated that British control over these two newspapers was an indication of their determination to protect their interests in China. Again, there was no attempt made to verify the story, not even the courtesy of calling up this office on the telephone to ascertain whether it was true or not. THE FAR EASTERN REVIEW was a charter member of the American chamber of commerce and for the first two years permitted one of its staff to act as secretary, when the chamber had no funds. Yet while its publisher was in the service, it was placed on the American black list and a new secretary of the American chamber of commerce who should have protected a member who was absent and could not defend himself, was the first to take advantage of the lie to advance his personal interests. It was a curious coincidence that for nearly two years the name of THE FAR EASTERN REVIEW was dropped from the chamber's mailing list; an oversight on the part of the secretary. The mere fact that THE FAR EASTERN REVIEW had a British editor and was printed by the press of the *North-China Daily News* was sufficient to condemn it, to place it outside the American fold. Its business was taken away and injured to the extent that a new American industrial monthly publication covering the Far East from Tokyo was enabled to start its first number with over one hundred pages of advertising matter at enormous war-time rates while this publication was barely able to eke out an existence.

To such an extent was the campaign against THE FAR EASTERN REVIEW carried in America that on the publisher's return after two years' war service, many of his old business friends in New York refused to see him. They wanted nothing to do with a paper engaged in boosting British products. It was impossible to sue the American government for damages. It was equally difficult to counteract or catch up with the report. The only remedy and a poor one at that, was to have the department of commerce officially deny it in the commerce reports. This was done, but coming a year after publication of the first report, it was too late. The business of this magazine in the meantime had been skilfully diverted to others. There was no redress. Our contribution to an honest idea of Anglo-American co-operation cost us at least $150,000 gold in business in two years and permitted two competitors to practically monopolize American advertising for the Orient. It was a great joke on The FAR EASTERN REVIEW. We are still laughing over it.

Let us look at another $100,000 phase of Anglo-American co-operation, which hides another joke at our expense. Three years ago in Peking, a general officer of the American army, confided to the publisher of THE FAR EASTERN REVIEW that the fiat had gone forth that he was to be broken and run out of China because of his uncompromising opposition to the then popular anti-Japanese agitation. Two days afterwards we were served with the papers in a libel suit for referring to a British subject residing in Antung as a "Sinn-Feiner." The damages were nicely calculated at $100,000 or all that THE FAR EASTERN REVIEW was estimated to be worth at that time. If the suit went against us, the little property we had created as the result of eighteen years of hard, up hill pioneering work would have been wiped out to satisfy the judgement. Incidentally all our American business would have gravitated to some other American-owned publication. The case in every way was identical in this respect with the celebrated libel suit against the *Chicago Tribune* for $2,000,000 damages, or the entire estimated value of its plant and property. It also was to have been wiped out because of its fight for honest government in Chicago. The right to sue a newspaper for the full value of its property and good-will was fought out in an American court which rendered the verdict that such damages were entirely out of proportion to the ends of justice, therefore illegal, a flagrant attack upon the liberty of the press.

Now as far as we have been able to discover, the suit against us was not intended so much to salve the wounded feelings of the gentleman whose political affiliations had been misstated as it was to get us on the witness stand and through a grilling cross-examin-

ation "show us up" through cleverly put questions designed to create the impression that this publication had been sold to Japanese interests.

Politically, the case was intended to keep alive the flagging agitation against Japan and help along the campaign to cancel the Anglo-Japanese alliance. It was to have been the international sensation of the year. Reuter's agency made a spread of the filing of the suit, and was prepared to give the proceedings world-wide publicity.

Three years have rolled by and the case has never been brought to trial—nor as far as we know, has it been withdrawn. We are still waiting to be "shown up." Now one of the cleverest jokes to play on a political opponent or business competitor is to get him into court in some civil action and never permit the case to come to trial or be stricken from the calendar. It has a most chastening effect on the victim of the joke. If the victim be the owner of a newspaper unduly critical of a corrupt gang which runs the government, it is an excellent club with which to regulate its policy. It puts its publisher in bad odor with the court and prevents any undue social intercourse with the judge. The suit against this magazine had just that effect with the American court in Shanghai.

We have already stated the facts in regard to the neat little trick which placed THE FAR EASTERN REVIEW on the American black list during the war and which cost us $150,000 in business. We will draw the veil rapidly over the subsequent movement engineered by members of the American chamber of commerce which resulted in the loss of one third of our advertising in three months, and say in parenthesis, that we hold the evidence that several American manufacturers were prevailed upon to cancel their advertising in this magazine and insert it in the weekly publication, whose editor officiated as secretary of the American chamber of commerce.

We might also state in fairness, that similar pressure was brought to bear on British firms to cancel their advertising, but without success. Special pressure was brought to bear on the manager of the engineering department of the largest British firm in China, because our opponents knew that by enlisting him on their side at least ten of the most important British machinery manufacturers would be guided by his example. This was intended as our *coup de grace*. The answer of this gentleman was very emphatic. He told the boycotters to go to Sourabaya.

Now comes the real joke. The prosecuting attorney in the case, was no other than the largest stockholder in *Millard's Review*. It is necessary for the community in which we live to get our perspective on this situation to understand the joke. Here we were being sued for $100,000 on a flimsy libel charge, through a lawyer who practically owned a competing newspaper known throughout China as the official organ of the United States court! We laughed heartily when two American and one British lawyer refused to defend our case when they learned who was acting for the other side. The joke was on us.

The legal proof exists that the editor of *Millard's Review* circulated a report which placed THE FAR EASTERN REVIEW on the American black list during the war while he was in honor obligated as secretary of the American chamber of commerce to defend its publisher at a time when he was wearing the uniform in France and could not protect his interests. There is further legal evidence in the columns of his newspaper that he wilfully published false and libellous reports calculated to discredit and damage the reputation of the publisher of this magazine.

There is also legal evidence in our possession that another incorporator and shareholder of *Millard's Review* circulated the story that the publisher of this magazine had "sold out to Japan," which was used as the basis of the boycott engineered by members of the American chamber of commerce to ruin our business and as justification for a series of bitter attacks upon us by the late editor and proprietor of the *Japan Chronicle*. It is a curious coincidence that after we had called a meeting of the executive committee of the American chamber of commerce (attended also by the American consul-general) and frankly explained our position and answered the reports circulated by our opponents and satisfied the meeting with documentary proof of everything we had to say, that within a few days we were faced with a libel suit brought by a British subject for statements made before this strictly private and executive American meeting. Again, the notice, curiously enough, was served through the legal firm whose principal partner was the principal shareholder in *Millard's Review*. This was Anglo-American co-operation with a vengeance.

Our sense of humor can be appreciated when it is known that some time ago we asked an American merchant prominent in the activities of the American chamber of commerce why he deserted THE FAR EASTERN REVIEW during the war. It was a source of great amusement to this gentleman. "Why," he laughingly replied, "should we have anything to do with your paper. You were on the list as a British publication. You were not on the job and your magazine was edited by an Australian and printed by the *North-China Daily News*. Naturally, American firms in Shanghai gave their support to a hundred per cent. American paper." Now this same patriot has since become managing director of a British registered company and a partner in one of the most important British trading concerns in China, one of the leaders in the movement for closer Anglo-American co-operation. Is it any wonder we are so mirthful?

The joke grows hilarious as we see the honorary secretary of the American chamber of commerce working hard for Anglo-American co-operation through the editorial columns of *The China Weekly Review* and *The China Press*. This mental gymnast was the most bitter opponent of the doctrine when practiced by THE FAR EASTERN REVIEW. Now, we find this uncompromising American patriot editing a daily newspaper owned by a British subject, just reversing the "treasonable" conduct of the publisher of this magazine. Of course when such eminent leaders of the American community in China change their viewpoints on Far Eastern political conditions, the common-ordinary-every-day American maintained in ignorance of their semi-governmental and administrative activities have no right to question the reasons why. Our political opponents of three years ago have seen the error of their ways and like the prodigal son are now seated at the table feasting on the Anglo-American calf fattened by THE FAR EASTERN REVIEW at a cost of $150,000 gold. May their waist line expand!

Coal Mining in Manchuria

The mining bureau of Mukden has opened two coal mines in the district of Fengtien, west of the Liao River. The first, which is in the foothills west of Koupangtzu junction on the Peking-Mukden railway, has been in operation over a year. Already the initial expenses are being repaid by the output of coal from the four working pits, writes the Takumen correspondent of the *North China Daily News*. Recently the bureau of mines despatched a trained mining engineer and staff, with adequate provision of funds to bore for coal in a scientific way at or near a mine 13 miles west of Takumen. Preliminary surveys have convinced that there is a wide field in the neigbourhood. At present the operations are hampered by a considerable depth of water. If the yield turns out as satisfactory as is expected, this mine will, like the first, be connected with the Peking-Mukden railway. To the nearest station Hsinmintun, a line of some 53 miles would be required.

Sino-Japanese Enterprise in Kirin

According to reports from Changchun, understandings have been established with the Chinese side through the efforts of Japanese acting-Consul-General Fukazawa, concerning the organisation of a company for working forests in Kirin and undertaking other enterprises in the province. It is said that a semi-official Sino-Japanese joint capital company will be established, called Chungtung Meilin Kungssu, the Chinese side being represented by the Kirin government. The capital of the company will be three million yen, which will be put up share and share alike by Chinese and Japanese, the Japanese promoters paying on behalf of the Chinese shareholders, for which the latter will pay annual interest at 6 per cent. Officers of the company are to be made up of a director-general, which post shall be filled by a Chinese, four directors, eight assistants, an equal number of Chinese and Japanese filling the posts. It is stipulated that a salary of 2,400 yen must be paid to each of the Chinese directors, and half of that sum to an assistant, irrespective of business conditions. In case of failure of the business, the Chinese side shall not be held responsible for the loss. The company will pay a sum of Yen 100,000 every year to the Kirin government as royalty.

Japan's Message to China

Baron Matsui in a splendid address before the Rotary Club of Tokyo sends a message to the people of China that Japan is their Friend

"In competition for trade and concessions for developments that are necessary or valuable in China we have little to fear from foreign rivalry. The field of China is big enough for all foreign investors and foreign business men. We have not the financial capacity to supply all the capital that China will require for decades to come: nor have we the commercial ability or resources to meet all of China's needs. But we have the advantage of the closest proximity: and if we develop our own ability within and among ourselves to meet the vast requirements of our neighbor, our rightful share of the trade cannot fail to come to us. And I believe that in developing this trade, and for the development of it, we cannot and must not fail to achieve the confidence and the friendship of the Chinese people."

"IT is difficult to realize, in this fast-moving age, how short a time ago it was when powerful leaders of powerful nations thought that to the strongest belonged the right to grab the most. Here in the Far East we have lasting reason to know what that policy of relentless competition meant. It was only a quarter of a century ago that the flags and the forces of foreign nations were following—and sometimes leading—their traders and investors into the territory of our great neighbor of the mainland. The scramble for concessions and the competitive drive for trade concerned our security as well as it did that of our unfortunate neighbor. The competition was generally called imperialistic, and that term properly described it, in so far as certain of the statemen of that day influenced or led their countries. But, in the minds of ordinary men, the struggle was for "business." It meant, they thought, more foreign trade, the development of home industry, the employment of more labor at better wages, and altogether better national prosperity, for their particular country. So the argument for the aggressive policy had a distinct appeal, and some of the ordinary men of all, and many of the ordinary men of some nations, permitted themselves to be led, misled, into the false cause. They followed without taking properly into account the costs and the potential dangers.

The spirit of commercial and imperialistic aggressions on the part of the few, however, created among others the necessity for defending their proper interests. Indeed, as in our case, our very security was menaced. We had no alternative but to do our utmost, with the support of other powers holding the same views, to preserve our neighbor from disunion and to stabilize the peace of these regions.

Baron Keishiro Matsui, Japan's New Minister for Foreign Affairs.

While our effort checked and eliminated the more serious dangers from competition in China, it did not strike at the roots and destroy the idea, established in age-old practice, that it was necessary for nations unduly to support their foreign trade with navies and armies. In other parts of the world similar practices continued. It was in that otherwise splendid country, which has given the world so much in thought and science, that the idea that force was a necessary concomitant for foreign trade found its most ardent exponents and its most general approval. Out of the idea of competition, carried to the extreme in Germany, came the great war with its calamity to the world. The states of Europe, and even many other parts of the world, are still suffering, and will have to endure grave hardships for many decades, as a result of that ghastly error.

But at least one valuable achievement has come out of the war. The nations have had an awakening. They have learned the lesson that war does not pay, and, within certain limitations, that armaments are wanton and are even instruments that breed hostility. They have learned that the business that can be gained abroad does not warrant what, in business phraseology, is called the "overhead charges,"—that is to say, the cost of armaments and the maintenance of armed forces beyond the necessities of their own security.

It was with a purged spirit and an experienced common sense that the nations most con-

cerned in the peace and prosperity of the Pacific ocean gathered two years ago at Washington. Agreement among the representatives of the several states was consequently easy to reach, and the treaties were duly and readily ratified. The results of the Washington conference we all know. The great achievement, the first of its kind the world has ever known, was an agreement between the principal naval power to limit the construction of the only character of vessel that can become aggressive. The four-power treaty pledged the governments concerned to enter into conference, discussion, and adjustment over any issue that might threaten to disturb their security in the Pacific. Treaties and understandings with regard to China were agreed upon and accepted by nine countries, giving a further added assurance that the old order of things shall not again prevail in her territory. These are incalculable blessings to us Japanese; and no government that would be likely to impair the spirit, to say nothing of the letter, of those treaties could endure in office in our country.

The relations between the greater powers concerned in the Pacific are now such that business men may have confidence in foreign enterprises not only for to-day but also for the future. They may invest abroad as well as at home with assurance that their efforts are less speculative, as far as international affairs are concerned, than they have ever been in the history of our ocean.

This is particularly a splendid assurance for Japan for we, at the present time, are in a stage of transition from a condition originally agricultural to one that is already largely one of manufacturing, commerce, banking, and shipping. By our understandings with other powers, we are freed of anxiety lest the difficulties that may come during our further transition may be made harder to bear by the possibility of international conflict. We are happily at liberty to work out our domestic readjustments without the dangers of serious foreign complications. And our foreign relations, being thus substantially based, I think I am not too sanguine in my belief that, while not ignoring our shortcomings or over-estimating our abilities, we may look also with assurance to the overcoming of our domestic difficulties and the solving of our economic problems. Without boastfulness, I think I may fairly say that we have character, ability, and wisdom sufficient for our needs, and that our measure of these qualities has been recognized by foreign nations. Everywhere we have friends. No man who has seen what other nations have done for us in our recent catastrophe, spontaneously and without design except to help us as fellowmen, could deny those friendships.

It is not only the business side of the matter—the hard, callous, calculating side, of human nature upon which we can depend. The side of humanity has had even a greater influence in changing the thoughts of nations. During the great war the cry among the soldiers in Europe was—"It shall never happen again"; and the spirit out of which that cry arose is not dead. I am an optimist with regard to humanity. I believe that just as in dealing individually as man to man, so in dealing with other nations, the more successful appeals are to the better qualities. The greatest difficulty is ignorance and suspicion. What men do not know they are inclined to distrust; and suspicions can be easily aroused at times by self-seeking individuals who pretend to have knowledge.

For example, it has been too frequently the case that concession seekers from one powerful country or another have gone into some undeveloped state and obtained rights for profitable enterprises, sometimes in conflict with the interests or the rights of nationals of other states; and unfair appeals have been made to the prejudices of their own people with the object of rallying support on behalf of their private interests. Too often such concessionaires have obtained this support, and the result has been irritation and counter-irritation far beyond justification and far beyond any general national profit that could come out of the enterprise. I am not speaking of any particular case; I am speaking only of the practice. Such practices have been followed in the past in the territories of North Africa, where we have no interests whatever, and in Atlantic states in South America, where we have practically none. It is not only in China that this sort of concessioneering has from time to time developed and caused newspaper and public rallyings of one nation against another. Fortunately, the governments of the greater powers have come to realize—as those of the lesser states have long been compelled to see—that it is often unfair and generally unwise to permit the interests of a single group of their nationals in foreign lands to disturb the friendships of their whole country.

Please do not misunderstand me. I do not mean to advocate the surrender of any fair principle or fair concession or fair business. On the contrary, I think it would be an unwise policy for any government, our own or some other, not to stand firmly in diplomatic support of its nationals in fair and honest enterprises in a foreign country. I mean only to say that the old idea that formerly prevailed with some nations, that it was the duty of a government to support aggressive competition on the part of its nationals, whether fair or unfair, was not only an unjust but likewise an injurious policy. The old principle of justice is a wise one among nations as well as among individual business men.

With specific reference to Japan, what my predecessors and the representative of our country at Washington have said is worthy of again repeating. In competition for trade and concessions for developments that are necessary or valuable in China, we have little to fear from foreign rivalry. The field of China is big enough for all foreign investors and foreign business men. We have not the financial capacity to supply all the capital that China will require for decades to come; nor have we the commercial ability or resources to meet all of China's needs. But we have the advantage of the closest proximity; and if we develop our own ability within and among ourselves to meet the vast requirements of our neighbor, our rightful share of the trade to come cannot fail to come to us. And I believe that in developing this trade, and for the development of it, we cannot and must not fail to achieve the confidence and the friendship of the Chinese people.

It is, happily, a new era upon which we are launched. The world is a wiser place. Men realize that they can with safety and even with profit let their kindlier instincts have fuller play."

Provincial Autonomy in China

Shensi Signs an Arsenal and Mint Contract

By Lawrence Impey

IN December, 1923, the writer published an article in THE FAR EASTERN REVIEW in which he described the proposed irrigation scheme for the Wei-peh area of the province of Shensi, giving at some length the schedule which had been drawn up under the auspices of the *tuchun*, General Liu Chen-hua, and pointing out the extreme value to China of the execution of even one or two such improvement projects. In the article was quoted the estimates arrived at by Chinese engineers who had surveyed the ground, and it was mentioned that the governor had some $500,000 in hand which might be used for this purpose in the event of any co-operation from outside the province, the idea being that possibly the China international famine relief commission might be willing to assist in promoting the scheme. The proposal in the rough was that the commission should be asked to contribute a million dollars, either as a grant or a loan, while the provincial authorities would subscribe the aforementioned $500,000, the whole being estimated as sufficient to carry out the major portion of the plan over a period of two or three years.

Since this information was published, however, the writer has been able to consult various engineers who have recently been on the ground, and has also obtained certain other information from various sources which lead him to very materially alter his views on the matter. In the first place it appears that the political conditions in the province are so unsettled as to render the prices for transportation of materials almost prohibitive, while to this must be added the doubt as to whether the threat of molestation by indis-

ciplined soldiers or bandits would not prevent the carrying out of the necessary field work. A description of conditions by recent eye-witnesses is extremely discouraging in this regard, as the following facts will prove:—

The province of Shensi, though nominally under one control, is in reality divided into five political or military sub-divisions as follows: General Liu Chen-hua is the *tuchun* or military governor, there being no civil administrator at the moment, and he manages to hold down twenty-one *hsiens* or districts under his personal supervision, these being located west of Wei-nan, south of Wei-ho, and west as far as the Kansu provincial frontier. As far as one can judge from reports from foreigners and Chinese these twenty-one *hsiens* yielded no less than eighteen million dollars in taxes during the past year, this money being mostly raised on opium. Of course it must not be supposed that the unfortunates in these *hsiens* are compelled to grow opium by the paternal provincial government. All that is done is to levy a tax of some $10 a mow (one-sixth of an acre), and if the unlucky peasant cannot pay he is pursuaded that he should do so by various unpleasant means, of which inprisonment is the least. It may be deduced, therefore, that if the farmers wish to grow other crops than opium it will be necessary for them to raise the money by such pleasant expedients as mortgaging their property or land, selling their children, or condemning their wives and daughters to a life of prostitution. That the opium is grown in quantities in order to avoid this alternative is evidenced by the prices obtaining in this area, for during the month of November, 1923, the drug was being sold at 65 cents per tael weight throughout the district, while opium pipes, lamps, etc., were exposed for sale in almost every bazaar and market.

On crossing the Wei river from General Liu's territories one finds the eleven *hsien* immediately to the north to be under the control of General Tcheng, who represents General Ho Li-tsun in this area and collects the taxes in the latter's name. It is worth noting *en passant* that the peasantry in this area are far less heavily taxed than they are in the Sianfu districts, as the soldiery are nearly all Shensi men, while those to the south of the river are imported from Honan. Opium is grown here too, though not nearly to such an extent, a witness who examined some seventeen villages testifying that almost all had at least one shop selling the drug.

General Yen Chen-tang controls the four easterly *hsiens*; Tungkwan, Hua Yin, Hua *hsien*, and Wei-nan, and these are reputed to be the richest *hsiens* in the province of Shensi if statistics are to be believed. At present the area is occupied by the twentieth division of central government troops and the first division of the Honan army, and the severity of the occupation inflicted by them must be seen to be believed. Whenever and wherever carts with draft animals make their appearance they are ruthlessly seized, while temples, inns, farms, houses, shops, and buildings of every kind are commandeered, misused, and wrecked without payment. As an example of rapacity one may instance Tungkwan, which with some 11,000 houses has to support a garrison of 6,000, who take everything they desire and pay for nothing. All cart traffic has been stopped on the main road leading through Tungkwan westwards, and what merchandise passes is carried by boat or wheelbarrow. According to the postal commissioner the average freight rate for goods between Kwanyintang at the head of the Lunghai railroad and the provincial capital of Sianfu—a distance of less than two hundred miles—is $130 per thousand *jin* (1,300-lb.) owing to the "protection" taxes levied by the military at Tungkwan. These taxes, which are levied on everything which passes with the exception of the post carts, run as high as $30 per boat plus forty cents a day for each "soldier" put on the boat as escort, while the boatmen are further required to feed their gallant defenders.

Continuing the examination of these political and military areas, one finds that the next one consists of twenty *hsiens* south of the Wei river basin, and that it is held by General Wu Shin-tien with his own military, who from all accounts *vie* with those of General Yen in their endeavors to exterminate the working population of the province. Turning thence to the fifteen most northerly *hsien* we find them to be controlled by a Major Yang with a small force of only some five hundred rifles, and it would appear that his rule is lenient when it is compared with that of most of the other militarist despots.

His districts are certainly poor and mountainous, but by dint of careful management the price of opium is kept down to eighty cents per tael weight, while despite this kindness shown to the rural population a not inconsiderable sum is raised annually by taxation of various kinds.

Thus it can be realized that conditions in the province are not of the best for the successful promotion of philanthropic or engineering schemes, even supposing that it is the intention of the authorities to promote the said schemes in a straightforward and honest manner. Unfortunately it is by no means certain that this will be the case, for competent Chinese and foreign observers are of the opinion that the whole irrigation project for the Wei-peh area is merely intended to increase the growth of opium on the territory thus benefited. Definite documentary proof of this intention is not yet to hand beyond these statements aforesaid, but the writer would wish in this connection to draw attention to recent events in connection with certain negotiations carried out by the Shensi authorities.

Two well-known engineers, one British and one American, made an extended visit to Sianfu and the surrounding districts in the fall of 1923, during which they surveyed parts of the Wei and Yellow rivers, looked over the Wei-peh irrigation scheme, and made an exhaustive examination of the industrial possibilities in the central portion of Shensi. It is due to these gentlemen that we have learnt that the Yellow and Wei rivers between Shanchow and Sianfu are either navigable for steamers or can be made so at slight cost, and in view of the fact that at present freight rates are so prohibitive over this area as to render it cheaper to ship in even such heavy articles as wire nails and piece-goods by parcels post, which is exempt from "protection" taxes, one can only hope that this navigation project will be permitted to come into being, and thus help in some small measure to alleviate the misery which now overwhelms the people.

One may well doubt if this will be the case, however, for although the *tuchun* of Shensi appeared desirous of discussing the irrigation and navigation plans when first approached, it soon became apparent that he was in reality far more interested in the possibility of obtaining an arsenal or a mint, or both combined.

The representatives of various firms were asked to tender for construction plant for these two purposes, but the majority of them were so handicapped by the agreement between the various powers as to the importation of any munitions of war as to be for all intents and purposes out of the running. The following schedule gives some idea of what was required to be tendered for, the total estimate for it being in the neighborhood of $360,000:—

1.	Melting shop with all fittings ..	49 pieces
2.	Rolling mill with all machinery	21 ,,
3.	Sampling room with furnaces	4 ,,
4.	Blank punching machines ..	57 ,,
5.	Mint plant	139 ,,
6.	Cartridge case plant	27 ,,
7.	Bullet machinery	28 ,,
8.	Cap machinery	16 ,,
9.	Loading machinery	16 ,,
10.	Clip-making machinery ..	20 ,,
11.	Gauges and tools	80 ,,
12.	Tools	116 sets
13.	Repair shop	18 pieces
14.	Electric equipment	100 k.w. generator with fittings
15.	Lighting and wiring fittings ..	
16.	Transmission	8 shafts with fittings
17.	Power plant	Engines, boilers, etc.

Of course the chances of the various firms desirous of tendering for such an installation would be in inverse ratio to the view of the legation concerned, for while, to quote an example, one national may be allowed to import a lathe of dubious utility labelled cotton spinning machinery, another may find himself immediately condemned for a precisely similar act. That this is the case is strikingly proved by the circumstances under consideration, for while the British and American firms found themselves prevented from competing by the stipulations put forward by the Shensi provincial authorities, Sino-German interests were able to successfully conclude a contract for a combined mint, arsenal, and electric lighting plant.

It appears that the terms offered by unsuccessful competitors were: 50 per cent. cash with order deposited in a foreign bank, 25 per cent. on landing material in China, and the remaining 25 per cent. in six months after delivery. The Shensi authorities on the other hand demanded either a guarantee by the legation of the

national concerned, or a cash deposit of equal amount to the contract to remain for one year as surety that the plant would work properly. The latter clause was obviously outside reason for any competitor, while the former was not available to Americans, Japanese or British.

The writer understands that the final agreement was signed between a Chinese representative on the part of the Shensi authorities and a Sino-German firm operating of Shanghai under a Chinese trade name. The contract calls for the erection of a 500 kilowatt water power plant working the mint and arsenal by day and the electric lighting plant by night, the engines to be 280 h.p. two boilers with superheaters.

Not only must these facts be of the greatest importance to commercial interests in China, but they throw a very illuminating side-light on politics in this unhappy country, affording an excellent reason for the present conditions of civil war and chaos, which so often appear to puzzle the foreign observer at a distance . It would seem on the face of it that the irrigation scheme previously referred to has but a poor chance at the present time, for Governor Liu Chen-hua has presumably used all his available resources for the arsenal and mint contract, and it is doubtful whether the international famine relief commission or any other body of philanthropic effort will be desirous of investing money in a province which is setting such an undesirable example, to the rest of China and where there is every likelihood that the financial assistance, if rendered, would only promote the growth of opium.

When one considers the existing provincial organizations in Shensi it appears that they are all financially bankrupt, for the road bureau is a hopeless failure, the flour mill is an almost unworkable wreck, while the present electric light plant not only fails to light but is encumbered with a heavy debt, for the payment of which a Hankow firm is pressing at the present time.

The erection of another mint and arsenal is merely another menace to the peace and prosperity of the country, and the Chinese would do well to ask the responsible authorities, if there be any such, by what right such a militarist threat is permitted. General Wu Pei-fu is presumably the person who will benefit most by the scheme for General Liu Chen-hua is his henchman, and he is therefore the one who should be held answerable by the Chinese people.

As far as foreign interests are concerned it is difficult to see what can be done in the matters for although the powers have an agreement as to the importation of the machinery for the manufacture of munitions of war other powers who are not parties to the agreement cannot be held responsible for contracts entered into by their nationals. The signing of this contract is of the gravest import, for the very fact that what is possible to some nationals and not to others tends to disrupt the existing unity of foreign nations which serves to maintain some semblance of governmental authority in China.

Friendly Restrictions

THE determination of the Japanese government to buy all foreign perpetual leaseholds in Yokohama at equitable prices is one against which Americans can make no consistent protest, even if they wished to retain any properties there, says *The New York Times*. The only form of land tenure open to foreigners in Japan will be no longer available, in Yokohama at least. It is implied in the report from Tokio that the United States government surrendered its leases upon two plots in that city, because it did not wish to continue to be responsible for the property. Even if it did, the perpetual leasehold title to these sites, used as a naval hospital and coal depôt, could not have been continued.

Whether or not this Japanese move is related to the recent decision of the United States supreme court in the Washington and California land-lease cases, handed down last October, it is entirely justified and should tend to promote respect for the Japanese people. Their foreign minister, addressing the imperial diet, noted with pleasure that their relations with the United States " continue to follow the path of traditional friendship." An old proverb urged one to love one's neighbor, but none the less not to pull down the hedge standing between the two houses. The traditional friendship between Japan and the United States should not be disturbed by the hedges which delimit the respective fields of the two, and determine the conditions of land tenure on either side.

What the opinion of the supreme court has settled is that the state act forbidding the leasing of land for agricultural purposes to an alien who cannot become a citizen, as well as to an eligible alien who has not declared his intention to become a citizen, is not in violation of the treaty which affirmatively permits the leasing of lands for residential and commercial purposes only. The motive of the restriction, hinted at by the decision of the lower court and agreed to by the higher court, is that one who is not a citizen and cannot become one lacks an interest in and the power to work effectually for the welfare of the state, and so may be properly denied ownership of land. Conceivably, it is urged, every foot of the land might pass to non-citizens. The supreme court decision does not, of course, discuss the wisdom or fairness of such limitation. It merely says that it is not inconsistent with the treaty between the two countries.

This being conceded, there can be no good reason for protest against the Yokohama buying in of our leases. Nor can we interpret it as a disturbance of international concord if, while we make special exemptions in favor of Europeans and persons of African nativity or descent, the Japanese should be disposed to show special consideration for their Asiatic non-white and non-black neighbors across the Yellow Sea, in view of the special relations that exist between Japan and China.

Competition for Machinery Trade of China

By W. H. Rastall, Chief, Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

THE returns published by the Chinese maritime customs covering the trade of China during the year 1922 have now become available and furnish an interesting illustration of the trend of international competition in that market and its influence on other foreign markets.

Returns are usually collected in haikwan taels. As the tael is a confusing unit, entirely theoretical, with a silver basis—and therefore subject to exchange fluctuations that most exporters find confusing—for the purposes of this discussion taels are converted into dollars.

Total Volume of Trade Increased

An examination of the returns show an unusual increase in the total volume of machinery absorbed by China during the years 1921 and 1922. (It is understood that the volume for 1923 is much smaller.) In both 1921 and 1922 China absorbed about 15 times the volume of machinery imported in 1915.

The participation of the different nations in the trade is shown in the accompanying table and chart, which is presented both on a basis showing the volume of the trade from each supplying country in dollars and in percentage.

Participation of Japan and Germany in the Trade

Since 1915 Japan has shown a surprisingly consistent increase in volume of trade, although the character of machinery produced in Japan and marketed in China is ordinarily very different from that produced in such countries as the United States.

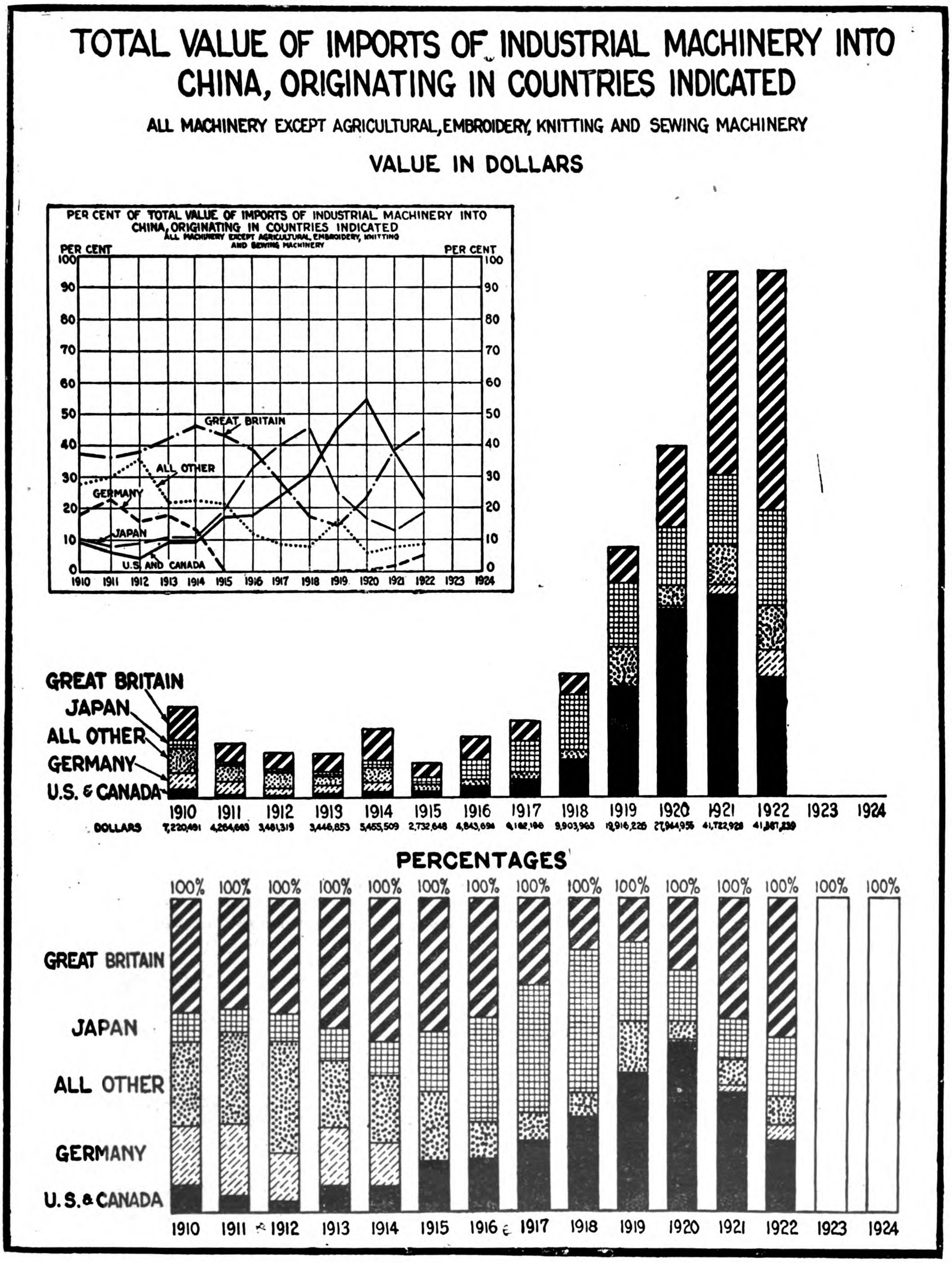
Germany occupied an important position in the machinery trade prior to 1914. During the war, trade was negligible, but

immediately following the armistice it began to pick up and greatly increased, at least through 1922, but even at its best, in spite of the advantage of the depreciating mark and various official efforts to stimulate the business, in spite of banking and diplomatic support and the advantages of organization in cartels, this trade has not assumed really significant proportions since the war, and the latest reports from China indicate that German competition is losing its potency there. It would appear that American manufacturers will not find the German influence in this market a matter of serious consequence before the political situation of Europe is clarified.

Competition Between Great Britain and America

Evidently the serious competition for the machinery trade of China lies very largely between American and British suppliers. The accompanying percentage chart shows the important position held by British interests in the trade prior to 1917, during which year the American participation was unsatisfactory. Under war influences, however, American participation in this trade increased rapidly, the volume of machinery exports to China being multiplied

(*Continued on page 118*)



Japan's Naval Policy

By K. Nomura, Rear-Admiral, I.J.N.

Rear-Admiral Nomura was formerly Japanese Naval Attache at Washington, and during the Washington Conference, Admiral Baron Kato's personal Aide. He was after on service in the Admiralty in Tokyo, and now commands the Japanese Yangtze Squadron.

ALTHOUGH the facts regarding Japan's naval strength and her naval program have been made public officially and cannot create alarm where there is capacity and willingness to understand them, occasional criticisms of our policy appear in the press, tending to revive suspicion and distrust. As a rule unfair critics defeat their own objects, but once in a while no little prominence and credence are given to arguments that are definitely unsound. For instance, there are the articles of Mr. Hector C. Bywater, a British writer, whose contribution to the "Atlantic Monthly" some time ago was read to the "Congressional Record" and republished in one of the American navy magazines. Men who are informed and unbiased would perceive at once how the arguments are largely trumped up in such writings, but there are so many men in prominent places—as the case in point show—who are inclined to take articles of this nature seriously that I am constrained to try to put the facts in simple form in the hope of discrediting any further attempts that may be made to destroy confidence in Japan and to undo the value of the Washington treaties, the greatest instruments the world now possesses for the maintenance of peace upon the seas.

Let me take up in detail the principal points made in the article in the *Atlantic*—which was the most potent because the most adroit of the several criticisms of the naval treaty that have been offered. The writer says:

"The Washington conference has undoubtedly been successful in arresting the multiplication of capital ships, but it imposed no veto on the building of other combatant types, save airplane carriers. The result is that to-day, barely twelve months after the acceptance of the limitation treaty, a revival of shipbuilding competition seems inevitable if the balance of power as regulated by that treaty is to be maintained. To state the case in a sentence; Japan, by diverting to the construction of cruisers and submarines no small part of the energy she formerly expended on capital ships, will soon be in possession of a fleet of auxiliary combatant vessels superior in some respects to that of any other power. During the last five years Japan has built or ordered no less than 23 light cruisers, as against a collective total of 16 for the United States and Great Britain."

The effect of this paragraph is to give a definitely erroneous impression. It is carefully worded but seems deliberately designed to alarm where no alarm is necessary.

Let us compare Mr. Hughes' original proposal for the limitation of auxiliary ships, as submitted to the Washington conference, with the present number of auxiliary ships in the possession of Japan, and let us also study the ration of the ships of that category between the United States, Great Britain, and Japan. Mr. Hughes' original proposal follows:

"The term auxiliary surface combatant craft includes cruisers (exclusive of battle-cruisers) flotilla leaders, destroyers, and all other surface types . . .

"It is proposed that the total tonnage of cruisers, flotilla

STATEMENT BY THE MINISTER OF THE NAVY

Because our government is required to make unprecedented appropriations for reconstruction in the devastated area, the navy department, like other departments, has been required again to reduce its budget. On revising our naval program, after the Washington conference, we drafted a proposed budget of Y. 278,000,000 for the fiscal year of 1923 and Y. 279,000,000 for that of 1924. We have now reduced the working budget for this year by Y. 39,000,000 and the proposed budget for 1924 contemplates a reduction of Y. 41,000,000, making our expenditures respectively Y. 239,000,000 and Y. 238,000,000. Of the latter account Y. 126,000,000 is for the ordinary and Y.112,000,000 for the special account.

In our working budgets for 1923 and 1924 the reductions below proposed estimates include Y. 88,000,000 in the construction of auxiliary ships, Y. 13,000,000 in expenditure on land and water equipment, and Y.2,000,000 in expenditure for warship reconstruction.

The estimate of direct naval losses as a result of the earthquake reached a total of Y. 91,500,000. Tokyo district suffered to the extent of Y. 20,000,000, Yokosuka and vicinity Y. 68,500,000, and Hiratsuka and vicinity Y.3,000,000.

The number of our auxiliary vessels, existing and contemplated, is as follows:

Cruisers completed or ordered by July, 1922	**17**
Cruisers ordered thereafter	**6**
Cruisers to be ordered, according to program	**2**

The work of construction has been started on two of the cruisers ordered since last July, the "Kako" and "Furutaka," the laying of the keels of the other four vessels being postponed till all necessary materials are available.

Destroyers completed or ordered by July, 1922	**57**
Destroyers ordered thereafter	**9**
Destroyers to be ordered, according to program	**15**

Five destroyers are being built, the laying of the keels of the other four awaiting the accumulation of necessary materials.

Submarines completed or ordered by July, 1922	**47**
Submarines ordered thereafter	**5**
Submarines to be ordered, according to program	**17**

In the matter of auxiliary ships, in which we are considerably below the ratio of sixty per cent., as compared with Great Britain or the United States, the revised program, arranged last year under the direction of the late Premier Kato, was to be completed in 1928. That date has now been deferred. As is well known, the construction of auxiliary ships is not restricted by the naval treaty, but we always regarded the agreement as one which the signatory powers would do well to observe in spirit as well as in letter. The writings of individuals to the effect that a new naval race had begun in auxiliary construction was never true.

Japanese naval men have been deeply affected by the recent demonstration of sympathy made to our country in its great affliction. The presence of warships in our harbors on missions of compassion, principally warships of powers associated with us in the naval treaty, has made a new and indelible impression upon all Japan.

"leaders, and destroyers allowed each power shall be as follows:
" For the United States ... ... 450,000 tons
" For Great Britain ... ... 450,000 tons
" For Japan ... ... 270,000 tons

" Provided, however, that no power party to this agreement whose total tonnage in auxiliary surface combatant craft on November 11, 1921, exceeds the prescribed tonnage shall be required to scrap such excess tonnage until replacements begin, at which time the total tonnage of auxiliary combatant craft for each nation shall be reduced to the prescribed allowance as herein stated. All auxiliary surface combatant craft whose keels have been laid down by November 11, 1921, may be carried to completion.

" No new construction in auxiliary surface combatant craft except replacement tonnage as provided hereinafter shall be laid down during the period of this agreement, provided, however, that such nations as have not reached the auxiliary surface combatant craft allowances herein-before stated may construct tonnage up to the limit of their allowance."

This, it should be noted, was in the original proposal, not in the terms finally agreed upon and included in the naval treaty. I emphasize this fact in order to show that Japan is living up to the spirit of the original project as well as the letter of the treaty.

Improvements have been made and changes, too, in the number of the auxiliary ships which we plan to construct,—as was publicly announced a year ago by Admiral Kato when minister of the navy. Instead of building nine cruisers of 59,215 tons (which were not yet ordered) and remaining thirty-seven destroyers cf 42,641 tons aggregate tonnage, as originally planned in the eight-eight program, our navy department now proposes to build eight cruisers of 68,400 tons (four of 10,000 tons each and four of 7,100 tons each) and twenty-four destroyers of 33,600 tons in aggregate tonnage—an increase in these styles of ships of 144 tons. The auxiliary craft that were to be constructed in keeping with our eight-eight program were to be completed over a period of several years, concluding in 1927; and naturally this slow construction caused a lack of uniformity in types, which the Japanese naval authorities, as would any other naval authorities, now seek to remedy.

As these auxiliary ships are completed, in the course of the next five years, they will replace the old vessels of the same character till the total strength of auxiliary surface combatant ships in Japan's Navy at the end of 1927 will be 107 vessels of 249,460 tons gross. This, it will be seen, is less by 20,540 tons than the 270,000 tons originally proposed for Japan by Mr. Hughes. It is, therefore, evident that only by refusing to accept Admiral Kato's official statement can the argument be maintained that Japan is directing her energy, formerly devoted to capital ships, to the enlargement of her auxiliary fleet.

Next, the question whether the ratio of 5-5-3 will be disrupted in the event of these auxiliary ships being completed by Japan is answered by a comparison of the strength of the auxiliary combatant craft of Great Britain, the United States, and Japan. The Japanese navy department's figures are as follows:

Table A.—Showing the strength of auxiliary surface combatant craft of the United States, Great Britain, and Japan, at the present time.

Country.	Cruiser.			Destroyer.			Total of auxiliary surface combatant craft.		
	No.	Tonnage	Ratio	No.	Tonnage	Ratio	No.	Tonnage	Ratio
United States ...	23	182,625	1	317	367,388	1	340	550,013	1.
Great. Britain ...	50	259,670	1.42	200	234,960	0.64	250	494,630	09
Japan	25	148,170	0.81	100	77,653	0.21	125	225,823	0.41

Remarks:—The above table shows the present tonnages irrespective of age. It will be seen that, at the present time, the ratio of auxiliary ships in the possession of the United States, Great Britain, and Japan are substantially 5.4 and 5.2 instead of 5.5.3.

Table B.—Showing the total strength of auxiliary surface combatant craft of the United States, Great Britain, and Japan, at the end of 1927.

Country.	Cruiser.			Destroyer.			Total of auxiliary surface combatant craft.		
	No.	Tonnage	Ratio	No.	Tonnage	Ratio	No.	Tonnage	Ratio
United States ...	10	75,000	1	280	334,921	1	290	409,921	1
Great Britain ...	55	299,830	3.9	201	238,720	0.17	256	538,550	1.27
Japan	28	171,055	2.2	92	104,980	0.31	120	276,035	0.66

Remarks:—1. According to the original proposal of the United States presented to the Washington conference, light cruisers shall be replaced by newly completed ships after 17 years from the date of their comple ion and destroyers after 12 years from the date of their completion, the vessels thus superseded being scrapped. In the above table, therefore, figures are taken of only cruisers that will be not over 17 years old and destroyers not over 17 years old and destroyers not over 12 years old.

2. The number and tonnage of the vessels for Japan are figured out on the assumption that she will complete her replacement before the end of 1927.
3. Those for the United States are figured out on the hypothesis that she will not undertake any new construction except that covered by her 1916 program, which was to be completed in 1924; and the same hypothesis is applied to the case of Great Britain.
4. But it is improbable that these two countries will not construct any new vessel before the end of 1927. Therefore, it will be seen that Japan's proportion is likely to be even further within the 5-5-3 ratio at the conclusion of her building program.

The American navy is not strong in cruiser strength, but, on the other hand, the destroyer strength of the United States is very superior; and it is grotesque to argue that Japan's program of eight light cruisers, to be constructed in the next five years, will give us a menacing predominance. If we should not build these ships our shipbuilding yards, now seriously hampered for want of construction, would be even more seriously injured, and it would be difficult for us to re-organize them in the future than for such highly industralized countries as the United States and Great Brtain to revive theirs.

At the same time that alterations in the program of cruiser and destroyer construction was made, in July, 1922, a charge was made in our submarine program. The number of submarines provided for in the eight-eight program, but not yet ordered, was forty-six, but this number was reduced to twenty-two, which means a decrease of twenty-four in number, or 13,539 tons in aggregate tonnage.

In Mr. Hughes' original proposal, Great Britain and the United States were to have 90,000 tons each and Japan 54,000 tons. In this connection it may be recalled that the Japanese delegate, at the meeting of the conference held on December 24, 1921, made the statement that, so far as Japan is concerned, 54,000 tons is the minimum of submarine tonnage with which her insular position can be adequately defended. The following tables will show what the several nations have in submarine strength at the present time and what they will have at the end of 1927, if we complete our program and the United States and Great Britain do not augment theirs—which again is most unlikely:—

TABLE A.

Showing present submarine strength

	Number	Tonnage	Ratio
United States	133	77,322	1
Great Britain	68	58,540	0.76
Japan	37	24,377	0.31

TABLE B.

Showing submarine strength at the end of 1927

	Number	Tonnage	Ratio
United States	121	84,900	1
Great Britain	76	68,370	0.81
Japan	67	68,536	0.81

Remarks:—The original proposal made by the United States provided that submarines can be replaced by new ones after twelve years from the date of their completion. Therefore, figures are taken of only those that will not be more than 12 years old.

In destroyer and submarine strength, Japan is now far behind other advanced naval powers, and, for the United States and Great Britain, which occupy a superior position as regards the ability to construct vessels of this description, the program of Japan is not such as could possibly cause true anxiety.

With regard to naval expenditures the next table will show that the charge that Japan is diverting her energy, formerly applied to the construction of capital ships, to an expansion of her fleet of cruisers, destroyers, and submarines is a complete fallacy, But the comparatively small savings we appear to be making in money may need the following explanation:—

In the past the expenditure contemplated by Japan, under the eight-eight program and authorized by the imperial diet, had been increased by only 20 per cent. over costs of construction in pre-war days. So light an increase, however, was far from sufficent, and the deficit in construction expenditure had been made up annually by appropriations authorized under a supplementary budget. The government submitted to the imperial diet at its last session a new naval construction bill, which provided for a revision of the expenditure for new construction, as is shown in the table below, and the bill was sanctioned. In that table the margin has been computed with an increase of some ninety per cent. above pre-war prices. Such an ample margin will, it is expected, save the Japanese naval authorities, from going to the diet for authority to make additional expenditure in the form of supplementary annual budgets in the future. It goes without saying that the said revised naval construction expediture includes an item for the conversion of two capital ships into airplane carriers.

TABLE SHOWING NAVAL CONSTRUCTION EXPENDITURE UNDER THE EIGHT-EIGHT PROGRAM AND THAT UNDER THE REVISED PROGRAM.

	1923	*1924*	*1925*	*1926*	*1927*
Naval construction expenditure under the 8-8 program	Y.147,413,102	Y.147,790,200	Y.143,258,418	Y.113,692,857	Y.115,377,355
Naval construction expenditure under the revised program ...	Y.116,262,479	Y.110,000,000	Y.110,000,000	Y.85,000,000	Y.71,054,030

Japan obviously has no desire to bring about a competition in naval armament. But the Bywater article says :—

"Less than a month after the Washington conference dispersed, it was announced at Tokyo that an agreement had been come to between the government and the shipbuilders whereby the latter would be provided with other work in lieu of the countermanded battleships and the wholesale discharge of shipyard workers would thus be avoided."

As a matter of fact many thousands of workmen were turned away from the shipyards.

Then the writer says: "The scheme was to retain practically intact that part of the 1920 program which related to auxiliary ships and to advance the dates of laying down these vessels. For example, contracts for cruisers which it had been originally intended to begin in 1923, 1924, and 1925 were respectively to be ante-dated twelve months, so that normal building programs of 1922, 1923, and 1924 would be in each case increased to that extent. In other words, twice as many auxiliary ships were to be laid down each year as the original program had legislated for. This plan embraced destroyers, submarines, and supply ships, in addition to cruisers."

This is entirely a misstatement. On the contrary, as previously explained, the number of cruisers, destroyers, and submarines to be constructed under the old program has been cut down. Not merely so, but, as may be observed from the foregoing figures representing annual expenditures, new construction alloted to each year under the eight-eight program has been reduced at an equal rate in the revised program for every year until and including 1927.

Mr. Bywater says, "It is patent to everyone that Japan is at present building more combatant tonnage than any other power ; but what is not generally appreciated is the fact that she is actually building more tonnage of this description than all the other powers combined."

We confess we are at a loss to comprehend the reason for this gross exaggeration. Japan is now building one cruiser of 5,500 tons each at the shipyard of the Kawasaki Dockyard Company, Kobe, the Mitsubishi Shipbuilding Yard, Nagasaki, and two other dockyards at Uraga and Yokohama, respectively, and one of 3,100 tons at Saseho—five in all of 25,100 tons total. These vessels constitute a part of the auxiliary ship program and were designed to be attached to the eight-eight fleet, the realization of which has now been abandoned in conformity with the naval treaty. At the beginning of this year the United States was completing and constructing 10 light cruisers of 7,500 tons each, and Great Britain two ships of 9,750 tons each, two of 7,550 tons each, one of 5,560 tons, two of 4,765 tons each, and one of 4,190 tons, or eight ships in all (according to a table on page 66 of the Naval Annual for 1923) and some of these have since been completed. Furthermore, the table in question shows that, while the light cruisers already in Japan's possession number 25 of some 100,000 tons, those of Great Britain number 60, representing approximately 310,000 tons. Is it that Mr. Bywater includes Japan's four ships of 10,000 tons each and four of 7,100 tons each, for which the keels are not yet laid down?

Our schedule provides that these ships are to be completed before the end of March, 1923. In Great Britain, three ships of the *Hawkins* class of some 10,000 tons each and two ships of the "E" class of 7,500 tons each have been either completed or are under construction. At first, the ships of the *Hawkins* class were fixed at four, but have since been decreased to three. Besides, Great Britain has the *Courageous* and the *Glorious* of 18,600 tons each. Under such conditions, it should be said that Japan is proceeding rather too slowly in the construction of cruisers of larger type.

The maximum tonnage of the light cruiser has been defined at 10,000 tons at the Washington conference, and in view of a new tendency among the nations of having at their disposal light cruisers of a tonnage approaching the said prescribed maximum, it is right and proper for Japan to adopt a program of completing four 10,000-ton and four 7,100-ton cruisers during the next five years.

Further, the English authority severely criticizes the alleged clandestine actions of Japan in connection with the question of the limitation of Pacific fortifications, saying:—

"In the fall of 1920, Japan worked out a scheme for fortifying the principal islands that guard the approach to the coast of Japan proper. This measure was intended to counteract the then impending development of Cavite and Guam as first-class bases for the American Pacific fleet. In December, the last of the batteries had been constructed and armed with heavy long-range guns, the barracks, munitions depôts, etc., had been constructed and every navigable approach had been rendered impregnable.

"Meanwhile, the Washington conference had assembled, and Admiral Baron Kato, of the Japanese delegation, had taken the first opportunity to inform his American colleagues that Japan regarded the abandonment of the Philippines and Guam fortifications as the condition precedent to negotiations for the reduction of her shipbuilding program. If the United States would agree to this, Japan, on her part, was prepared to suspend her own plans of fortifying her Pacific Islands, and would at the same time co-operate most willingly in any practicable scheme for limiting her floating armaments.

"Baron Kato did not add, however, that Japan, having been secretly engaged in fortifying her island bases for many months previously, had just completed the work."

We do not deny the fact that, with the view of strengthening the defences of our homeland our government devised a plan of fortifying the Bonins, which are situated at a distance of only 500 miles from our coast, and when the disarmament conference was called at Washington the fortification work in these islands was in course of progress. There is nothing strange about that. The United States proposes to set up strong naval bases and forts in the Hawaiian Islands, separated from her homeland by 2,100 miles of water, and Great Britain is considering fortifications at Singapore. But the allegation that, on learning the project on the part of the United States to call the Washington conference, Japan sped up the work of fortifying the Bonins with frantic haste in order that she might gain an advantageous position in the discussion of the question of the limitation of Pacific fortifications at the conference

is diametrically opposed to actual facts and is a canard pure and simple. Our budget and financial procedure preclude the possibility of advancing and carrying out in one fiscal year a work destined for the next. Japan saw no necessity of speeding up the work for strengthening the defense of these islands. It should be noted, moreover, that the question of the limitation of Pacific naval bases and fortifications was first taken up when the capital ship ratio question had come to a deadlock.

Japan's attitude toward the conference was plain and above board; she acted openly and fairly throughout at that memorable international gathering, and it is a cause of profound regreat to us that anyone should accuse her of underhand machinations and put a slur on her uprightness and probity. Many things prove that Japan conferred with the other powers in a spirit of candour, justice, and fairness at the conference. It is a case in point that she met with great difficulties in regard to the *Mutsu*. Had she announced officially and in time the completion of that capital ship, previous to the opening of the conference, she wuld have been spared those difficulties.

The British authority describes at length how, being deprived of an opportunity of constructing a strong naval base in the western Pacific, the ability of the United States to conduct offensive operations in that quarter has been frustrated. Some American naval experts are wont to advocate the possession by the United States of a naval strength of 3-2 on the ground that the present state of her Pacific naval bases is anyting but perfect and the line of communication between her homeland and possessions in the western Pacific is long. It would be indubitably convenient for the United States from a strategical viewpoint if whe were in possession of perfectly equipped naval bases that could extend full facilities to the entire American fleet in the western Pacific in case she engages in hostile operations in this part of the globe; still it is none the less needful to view a question of such vital importance jointly with international political relations and from an elvated standpoint, not from a military and technical angle only. Suppose the United States should have built large naval bases with docks, each having a capacity for huge battleships, naval arsenals for their repair, oil tanks, magazines, etc., in the Philippines and Guam and should furnish the entire fleet of her warships with facilities for starting activities at any time in these Far Eastern waters; and suppose that she had insisted on the indispensability of these provisions for the defense of her insular possessions; the American people might have approved but the Japanese would necessarily have taken it as a great menace to their security. If Americans consider the reason for their own purchase of the Virgin Islands from Denmark at the cost of $25,000,000 and also why they cannot welcome the opening of a European naval base in one of the foreign possessions in the Caribbean Sea, they will then, we are convinced, thoroughly understand how the Japanese would not like to see large naval bases built in the Philippines and Guam. "Do unto others what you would have them do unto you." This is not only a maxim for individuals but also for nations. By rejecting at the Washington conference a policy that would have been construed as a minatory attitude toward other countries and by acceptng an agreement on the maintenance of the status quo of the naval bases and fortifications in the in the Pacific, the American delegates secured a harmony of the policies of the powers, which was of paramount necessity for success and contributed in a great measure to promote the progress of mankind toward the ideals of averting armament competition, minimizing the chances of war, and generally uplifting the welfare of the world's peoples.

It seems to us that Mr. Bywater is recommending to the American people the adoption of the so-called "mailed fist" policy, which some of the powers were wont to pursue before the late war.

He concludes his essay with a lengthy statement on commerce raiding. However, the country that would suffer in war from raids on sea-borne trade is not the self-supplying United States but Japan, whose resources are not sufficient to supply her wants at home and whose lines of communication with the Asiatic continent are liable to be menaced—to say nothing of the loss of her entire trade with the United States and the crippling of her communication with Europe. It takes no naval expert to see this, though this authority sees the reverse.

All in all, Mr. Bywater's views are instrumental in provoking distrust of Japan, if not actually intended to do so. But we have faith that men of fair and equitable judgment, if they know the facts, will not give ear to arguments such as his, for whatever reason inspired; and that those who welcome it will be only a minor and jingo section of the American people. It is the firm determinatior of the American people. It is the firm determination of us Japanese, now that amicable relations have been established among the great power through the Washington conference, to do our utmost for their preservation and consolidation, and it is with this object that I have written.

Competition for Machinery Trade of China

(*Continued from page 114*).

many times, and this expansion as expressed in dollars continued through 1921, though as expressed in percentage the participation of the United States and of Canada decreased from that of 1920. In 1921 the share of business secured by British manufacturers was almost exactly equal to that attained by American producers, each securing practically 40 per cent., but in 1922 the American participation in this trade shrunk to about 23 per cent., while the British expanded to approximately 44 per cent.

American manufacturers should give serious attention to this matter as it may be indicative of tendencies in other foreign markets. Careful thought should also be given to sales effort. It would seem that unless American machinery is supported in the world's markets with more aggressive and consecutive salesmanship, our engineering products would fail to hold the position in those markets that their superior engineering merit deserves.

Chinese Practice to be considered

It is true that the situation cannot be expressed with a simple diagram and a few crooked lines on a chart, for in China the machinery trade is largely influenced by railway, mining, and other enterprises held by concessionaires who are required, in at least some instances, to purchase their engineering materials from the countries that originally furnished the capital on which the enterprises were developed, and, in such markets as Japan, where greater freedom exists, the British participation has not been so important. There are also a large number of other factors that might be introduced in this discussion, but the fact remains that American manufacturers should give thoughtful attention to the position they are coming to occupy in all foreign markets.

The following table shows the total value of imports of industrial machinery into China, and the countries of origin of such imports:

Total Value of Imports of Industrial Machinery into China.

[All machinery except agricultural, embroidering, knitting and sewing machinery.]

Year.	From Great Britain.	From Japan.	From Germany.	From all other countries.	From United States and Canada.	Total.
	$	$	$	$		$
1910 ...	2,661,983	686,356	1,295,789	1,935,700	640,663	7,220,491
1911 ...	1,514,635	302,329	964,132	1,235,232	248,335	4,264,663
1912 ...	1,304,557	287,471	524,379	1,231,858	133,054	3,481,319
1913 ...	1,439,024	360,738	606,643	736,019	304,429	3,446,853
1914 ...	2,511,930	571,466	707,893	1,207,836	456,384	5,455,509
1915 ...	1,180,786	516,783	3,690	578,075	453,314	2,782,648
1916 ...	1,857,174	1,572,914	6,844	554,724	852,038	4,843,694
1917 ...	1,698,335	2,492,407	......	517,970	1,453,475	6,162,196
1918 ...	1,655,141	4,498,085	......	738,921	3,011,818	9,903,965
1919 ...	2,882,815	5,010,817	......	3,115,853	8,906,741	19,916,226
1920 ...	6,483,992	4,622,237	82,278	1,651,534	15,104,914	27,944,955
1921 ...	16,163,447	5,428,043	731,227	3,288,667	16,111,544	41,722,928
1922 ...	18,541,803	7,585,592	2,095,516	3,507,039	9,657,289	41,387,239
			Percentages.			
1910 ...	36.9	9.5	17.9	26.8	8.9	......
1911 ...	35.5	7.1	22.6	29.0	5.8	......
1912 ...	37.5	8.3	15.1	35.3	3.8	......
1913 ...	41.7	10.5	17.6	21.4	8.8	......
1914 ...	46.0	10.5	13.0	22.1	8.4	......
1915 ...	43.2	18.9	.13	21.17	16.6	......
1916 ...	38.4	32.5	.14	11.36	17.6	......
1917 ...	27.6	40.4	......	8.6	23.4	......
1918 ...	16.7	45.4	......	7.5	30.4	......
1919 ...	14.5	25.1	......	15.7	44.7	......
1920 ...	23.2	16.5	.3	5.9	54.1	......
1921 ...	38.7	13.0	1.8	7.9	38.6	......
1922 ...	44.8	18.3	5.0	8.6	23.3	......

Developments in the Far Eastern Steel Industry

1. Troubles of the Han-Yeh-Ping

THE next two years promises some interesting developments in the Far Eastern iron and steel industry. According to reports in the vernacular press, the great Han-Yeh-Ping enterprise is in financial straits and may be taken over by the Japanese, in which case Japan will practically control the blast furnaces and steel mills of China. The affairs of this company are reported to be in such a tangled condition that it is difficult for any one but an expert with full access to the accounts to unravel the facts surrounding its financial adventures of the past decade. The Han-Yeh-Ping Company started early in its career to borrow funds and after a few preliminary loans from Europe or America, turned to Japanese interests for financial assistance. As usual, however, where Japan is concerned in any industrial loan to China, her motives are distorted into some fantastic allegation that she harbors designs on the sovereignty of the country or intends to wreck the enterprise. Why the keen financiers of Japan would deliberately throw away their hard-earned millions in wrecking Chinese enterprises and then invest an equal or greater amount to restore them to a profitable working basis, is difficult for any but a warped mind to understand or explain.

Anti-Japanese Propaganda

It is within our knowledge that sometime about 1910 an American steel expert made a very careful examination of the Hanyang Iron and Steel Works and reported to his superiors in New York that the plant was obsolete and inadequate as security for a large loan and furthermore, in order to compete with foreign mills at a profit, it would have to be remodeled or completely rebuilt. European experts made similar reports on the property as it then existed. Despairing of obtaining financial assistance from these quarters the Han-Yeh-Ping Company turned to Japan. The Japanese at that time faced an industrial future with a very limited supply of iron ore within their own domains and were seeking an assured supply from abroad. When the Chinese in 1913 asked them for a further large accommodation it was stipulated in the loan agreement that during its life of forty years the Han-Yeh-Ping should supply a minimum of 400,000 tons of ore and a maximum of 600,000 tons at a basic price of $3.00 (Mex.) a ton delivered at the Yangtze.

This exceptionally fair agreement has been held by anti-Japanese writers as constituting irrefutable evidence that Japan was seeking to wreck the enterprise preliminary to demanding control.

In any discussion of Japan's special interests in the Han-Yeh-Ping enterprises common fairness demands that certain facts be kept always in mind. The alleged wickedness of her transactions would seem to consist in tieing the company down in a contract to supply a stipulated tonnage of iron ore over a period of years at a fixed price and that owing to war conditions the contract could be carried out only at a heavy loss. Now when the contract was entered into in 1913 the ruling price of pig iron had varied little over a long period of years. There was no reason to believe at the time that a world upheaval was coming in 1914, that would completely upset normal market conditions and prices, especially with an enterprise which operated one of the largest open-cut mines in the world and in a country where no matter what might happen, a plentiful supply of the cheapest kind of cheap labor was always procurable. Whatever price was agreed upon for iron ore or pig in 1913 could never have been greatly modified by purely local conditions and when the Yokohama Specie Bank advanced a loan to the Han-Yeh-Ping on the condition that 400,000 to 600,000 tons of ore be supplied to Japan annually at $3.00 mexican per ton, an enormous profit was left to the company out of which it could easily have repaid the loan long before maturity.

This statement is fully borne out by the figures given by Mr. Chung Yu-wang in a paper read before the American Iron and Steel Institute on October 26 of last year. Mr. Wang gives the detailed cost of a ton of iron ore delivered at the wharf at Taiyeh during 1913 as approximately $1.00 mexican per ton. When the Japanese agreed to pay the Han-Yeh-Ping three dollars per ton delivered at the wharf in the same year, it left a margin of two dollars or a yearly profit of from $800,000 to $1,200,000 on the ore contract alone. This extremely liberal price disproves the contention that Japan sought to ruin the Han-Yeh-Ping and provides evidence that it was solely concerned in obtaining an assured supply of ore at a fair price that would enable the Chinese to live up to the terms of the contract and repay their obligation from the immense margin of profit. The costs were naturally increased during the war, but if we again accept the figures submitted by Mr. Wang at no time up to 1919 did they exceed the price paid by Japan. He says that the cost of a ton of Taiyeh ore delivered at the wharf at the Yangtze in 1919 was $2.80 (mexican) including interest and depreciation, still leaving the company a margin of twenty cents a ton, equivalent to about six per cent. profit. He is also responsible for the statement that within the past year the company of which he is the technical head, has entered into a contract with the Hupeh government mining bureau operating the Elephant Nose Mine at Taiyeh to deliver at the Taiyeh wharves 60 to 70,000 tons of ore based on 60 per cent. iron content at $3.60 per ton.

The peculiar conditions surrounding the Japanese contracts with the Han-Yeh-Ping have been lost sight of in the popular craze to condemn her policies in China especially in her attitude during the negotiations over the twenty-one demands, where the Chinese government under pressure agreed to give its permission in the event that the Han-Yeh-Ping Company and the Japanese capitalists agreed upon co-operation. It also agreed not to confiscate the properties of the Han-Yeh-Ping or convert it into a state enterprise, nor cause it to borrow and use foreign capital other than Japanese.

Only one who has an intimate knowledge of how the Peking and Nanking governments compelled private enterprises during 1912 to raise funds for government use can fully appreciate the motives behind the Japanese demand. There was nothing to prevent the Han-Yeh-Ping from raising additional loans on their properties from other foreign sources and destroying the security pledged to Japan. Now when foreign capitalists advance millions to a private Chinese enterprise and the latter is obligated to furnish in return some commodity of prime necessity to the industrial life of the lending country, and a war intervenes which makes it vital that the terms of the contract be fulfilled, there is some justification for insisting that nothing be permitted to arise that will vitiate the contract. In view of the general laxity of the Chinese government in contracting foreign loans on securities or revenues previously pledged for the service of other obligations. Japan cannot be too harshly condemned for taking drastic measures to protect her investment in the Han-Yeh-Ping.

Had she not done so it is a foregone conclusion that the Peking government would have forced the company to contract other engagements which would have deprived Japan of her main source of iron supply and destroyed the security for her loans. These facts would indicate that if the Han-Yeh-Ping has been unable to live up to the terms of its contracts with Japan the fault does not lie entirely with the latter. The fact remains, however, that the Han-Yeh-Ping is facing a serious crisis. If the company is wrecked as we are told it will be, certainly the people who have consistently advanced millions to save it cannot be held responsible, nor can they be condemned for taking energetic steps to protect their investment from being made a source of international friction through being pledged as security to other foreign capitalists.

Japan's Losses in Seeking Iron

The Han-Yeh-Ping may go under or it may be infused with new life but in either case it means a further large investment on the part of the Japanese bondholders. Professional critics of Japan overlook the fact that the failure of the Han-Yeh-Ping to live up to its contract with the Yokohama Specie Bank has compelled Japan to invest millions in developing other sources of iron supply to meet her increasing requirements. Had the Tayeh properties developed the maximum output of ore they would have been able to supply not only the requirements of China but of Japan as well and at a considerable profit to the company, despite the rise in prices due to the war. The failure of the Han-Yeh-Ping to meet the requirements of Japan at a most critical time in world history when Japan's very existence might well have hinged on her ability to obtain iron ore in large quantities, compelled her to establish the Anshan Iron Works in Manchuria, the Mitsubishi Works at Kenjiho in Korea and to exert every effort to gain control of other deposits in China. The Lungyen blast furnace although nominally operated by a purely Chinese company has as its director general, Mr. Lu Chung-yu, one of the foremost pro-Japanese officials in the country. The Liu Ho-kou Mining Company which recently acquired the blast furnaces of the Yangtze Engineering Works at Hankow is directed by Mr. Tsao Ju-lin another intensely pro-Japanese official. Whether Japanese capital is interested in these concerns or not may be difficult to establish, but there can be little doubt that the closest friendly relations exist. It may be an exaggeration to state that Japan controls all the blast furnaces in China, but it is well within safety to say that in the event of an emergency she would receive preferential treatment of the output of the larger Chinese-owned iron mines and the products of Chinese-owned blast furnaces.

The Anshan properties alone have cost the South Manchuria Railway Company to date over Y.35,000,000 and another Y. 20,000,000 will probably be expended in the next year to remodel the plant for the new reduction process in order to save the original investment. The Mitsubishi Iron and Steel Works in Korea are capitalized at Y.30,000,000 ; Okura and Company have $7,000,000 locked up in the Penchihu iron mines and blast furnaces and other millions have been paid over at various times to Chinese authorities for the acquisition of concessions and properties in other parts of China. It is not far from the mark to say that Japan has been compelled to invest over Y.100,000,000 in developing sources of iron supply in China because of the failure of the Tayeh mines to deliver the tonnage contracted for in 1913. Every cent of this huge expenditure could have been saved had the Tayeh properties been developed along lines that would have met the requirements of Japan. Much has been written about Japan's schemes to control the iron supply of China. This brief outline of hard facts will help dispel some of the erroneous ideas about Japan's designs upon the integrity of China through control of her iron mines and will help open-minded people to understand why she is entitled to every consideration from other foreign interests because of the huge sums already sunk in China in the vain effort to protect her vital interests.

A 200,000 Ton Steel Mill Project at Anshan

In our November, 1923, issue we presented the outline of the new hematite reduction and magnetic separation process invented by Mr. T. Umene, superintendent of the Anshan Iron and Steel Works operated by the South Manchuria Railway Company at Anshan in Fengtien province. It is now accepted that the adoption of this process will enable the low-grade ores of the Anshan region to be economically treated and on the strength of the trials the S. M. R. is preparing to enlarge the Anshan works in the course of the next two years to a producing capacity of 200,000 tons of pig iron per year, while similar investigations have been carried forward which are to be made the basis of for establishing a steel works producing 200,000 tons per year.

The success of a steel industry in Manchuria would depend largely upon the ability of the Japanese manufacturers to supply the home requirements. According to a report of the S. M. R. investigators the Japanese manufacturers have a very strong combine in which are associated the following companies : The Kokura Steel Works under the Asano management, the Tokai Steel Industry Company at Wakamatsu, the Tokuyama Foundry of the Osaka Steel-Plate Company, the Hyogo Works of the Kawasaki Dockyard Company, the Kobe Steel Works, the Osaka Iron Manufacturing Company, the Plate Mill of the Asano Dockyard, the Japan Steel Pipe Company, the Tokyo Steel Company, etc. At all these works about 200,000 tons of billets, blooms, slabs, plates and small sized products are turned out annually. To make up the partial deficiency in Japan's consumption, the government steel works at Edamitsu is able to furnish about two to three thousand tons per month for pr;vate use and the balance must be imported. This opens a very wide field for a new Japanese plant in Manchuria to manufacture the smaller and medium sized steel products used in the Japanese market.

The government plant at Edamitsu and the Tokuyama Works of the Osaka Iron Plate Company are the only two plants in Japan turning out steel plates, the total production being only 30,000 tons per year. The Kawasaki Dockyard Company is reported as planning to expand its Fukiai Works to an output of 120,000 tons of steel plates per year and as the consumption in Japan is placed at 100,000 to 150,000 tons per year, these mills would about take care of the demand if the Kawasaki project is carried out. In the matter of steel rails Japan consumes about 80,000 tons per year, of which 30,000 are supplied by the Edamitsu Works and the balance imported. The demand for new rails in Manchuria would keep pace with railway construction and granting that this would proceed at the rate of 100 miles a year the demand would not exceed 20 to 30,000 tons which would hardly warrant the great investment for a rail plant at Anshan. The S. M. R. is now conducting investigations of its own at the ports of entry in Japan checking off the shapes and sizes of imported steel products in order to have a more accurate basis on which to plan the scope of the new steel works.

According to the trade returns of Japan the importation of " T " and angle iron and steel for 1921 was about 145,000 tons, and in meeting the demand for these products the S. M. R. hopes to make a success of a steel plant at Anshan.

The Electric Steel Plant at Dairen

An industry which is forging ahead with little noise is to be found located near the Electric Park in Dairen, and as usual with other progressive enterprises in Manchuria the initial expense has been largely borne by the South Manchuria Railway Company. For many years the S. M. R. maintained at this point a metallurgical experimental institute but in 1918 turned over its equipment to a Sino-Japanese concern called the China Electric Metallurgical Company, Ltd., which has since been turning out high-tempered tool steel tor the market in Manchuria and Japan. The works are under the direction of Mr. K. Kamijima a Japanese engineer and inventor who has developed processes along strictly original lines which find no parallel in Japan. It is claimed that his high-tempered steel products have no equal in the world and it is said that in time his inventions will introduce a new epoch in steel manufacture. For the present the works are turning out five kinds of high-tempered steel, two kinds of stainless steel, two kinds of electric resistance steel and a magnetic steel.

The inventor is now working on steel for armament use, special cast steel and an anti-friction alloy and the results obtained are so satisfactory that within a short time full details will be published by the company. The works are still largely in the experimental stage and have been accommodated with working capital from time to time by the S. M. R. They are far from being fully equipped owing in the first place to the low demand for high-grade steel in Manchuria and because it had neither the time or the resources to develop a market for its products in China or Korea.

The products of the company are, however, attracting the attention of the industrial world in Japan and are in increasing demand and it is now hoped that in a short time the works will be considerably expanded. The following patents have been taken out in Japan : (1) Patent No. 2,988. Process for manufacturing high-tempered steel. (2) Patent No. 40,316. Process for manufacturing special high-tempered steel containing vanadium, cobalt and molybdynum. (3) Patent No. 50,921. Process for manufacturing low carbon ferrochrome.

An application for another patent is on file for a process of manufacturing an alloy for electric resistance. The application for patent number 64,626 for the manufacture of special high-tempered steel has already been granted. Many of these products as yet have never been produced in Japan and as the output of the Dairen works is pronounced as good if not better than imported products

it is hoped that Japan in time will be releaded from further reliance upon foreign makers.

The company also operates a small plant in Tokyo under the name of the China Tool and Machine Company, Ltd., which utilizes the products of the Dairen plant for the manufacture of tools and machines.

The New Steel Plant and Rolling Mill at Pootung

The difficulties which attended the operation of the Han-Yeh-Ping Works and the delay in starting other enterprises has provided the opportunity for a new company to enter the field. A company known as the Woo Ching Iron and Steel Company with offices at 24 Kiangsi Road in Shanghai has erected works located on the Pootung side of the Whangpoo River opposite the Kiangnan Dockyard. This plant has been in process of development since 1917 when Mr. Lo Pak-hong installed the original blast furnace with a capacity of 350 tons of pig per month. The initial cost was only $80,000 and the output, sold at Taels 250 per ton, enabled the owner to pay for the plant in three months. A second and larger furnace of 1,000 tons monthly capacity was then installed, constructed entirely from local materials turned out in local Chinese engineering shops but under the direction of German engineers. The plans were drawn up by Mr. E. Kocher of the Siemens China Company and the work superintended by Dr. M. Bruecher, technical manager of the same company, while the contract was carried out by Mr. Li Kok-king.

With the installation of the blast furnace a steel works and rolling mill were added which will turn out monthly about 1,200 tons in bars, billets, T's, bamboo-steel, bars for reinforced concrete and light rails up to 26 pounds in weight. The equipment embraces two Siemens-Martins ovens and a rolling mill supplied by the Siemens-Rhinelbe-Schuckert Union through their China agents, the Siemens China Company. One of the ovens will have a capacity of 12 tons per day of seven hours and the larger one of 35 tons per day of ten hours, a combined monthly capacity of 1,300 tons.

The company has its own ore supplies in Chekiang province and is connected with the Ihua Iron Mining Company of Wuhu. The power required for the plant, about 1,000 kilowatts, will be supplied by the Chinese Electric Power Company of Nantao. The original capital of the company $80,000, was increased in 1918 to Taels 250,000 and in 1921 to Taels 1,000,000 of which three-quarters has been paid up. The cost of the new plant is Taels 900,000.

The company is a purely Chinese concern operating under a license from the ministry of communications with Mr. Loh Pa-hong as managing director but the manager and assistant manager will be German. Local steel requirements are estimated at 60 to 80,000 tons a year and with its output of 12,000 tons the company expects to find a ready market for its products. It is also equipped to make the larger steel castings for ships and machinery and cast iron and steel pipes.

The Singapore Steel Plant

Another interesting development in the Far Eastern steel situation is the erection of a steel plant at Singapore by the United Engineers, Limited, the strongest engineering firm in Malaya. This company, so widely known throughout the Far East, is an amalgamation of the old firms of Riley, Hargreaves & Company and Howarth, Erskine & Company, Ltd. For many years the latter company maintained an office in Shanghai and carried out several important engineering works, amongst which was the erection of the Garden Bridge, one of the most difficult problems our local engineers had to contend with.

One of the most significant engineering developments in Malaya is the building of huge dredges for working the tin deposits for which that part of the world is noted. Most of the placer workings have been exhausted and for Malaya to retain her lead in tin production, the mining companies must now go down to bed rock. In order to meet this new situation, the United Engineers, Ltd., have equipped their plant at Singapore to build dredges and at the present time are constructing three of the most powerful yet ordered for work in the Malayan peninsula.

In connection with this they have also installed a complete steel plant which though of modest capacity, is fully equipped to handle the work for the mining, rubber, shipping and other industries of that region. They are already turning out cast steel gear wheels, bushes and clutches, screen rollers, pads, etc., for dredges, press tops for oil mills, valves for compressors, stone crushing jaws and other castings.

* * *

The Iron and Steel Industry in China

By Chung Yu-wang, Head of the Technical Department, Liu Ho Kou Mining Company, Peking, China.

Paper read before the American Iron and Steel Institute.

Indications show that the people of the United States have awakened to the idea of the great possibilities of foreign trade in the Far East. Hence I hope this paper, in which I shall try to set forth in as succinct a manner as possible a few of the salient points about the iron industry in China, may further awaken their interest in one of the great basic industries of a nation; that is, the iron industry in China.

Let me, first of all, give you an idea of the iron ore as well as an estimate of the reserves in China. The following estimate of ore reserves of the iron deposits so far known in China, suitable to modern blast furnace work as regards type, character and situation (excepting those scattered and unimportant sedimentary deposits found in almost all of the provinces of China, which may amount to 300,000,000 tons and which are only adaptable for native furnace work) shows the quantity to be in the neighborhood of 600,000,000 tons.

The iron ore reserves, as estimated by V. K. Ting, director of the Chinese geological survey, with, however, minor alterations, are as follows:

Provinces	Iron Ore	Theoretical Iron Content
Chili	86,469,000	42,896,000
Fengtien	287,580,000	105,205,000
Shantung	22,920,000	14,138,000
Honan	3,400,000	1,640,000
Anhwei	27,500,000	13,525,000
Kiangsi	18,260,000	8,771,000
Hupeh	52,687,000	30,095,000
Kiangsu	39,080,000	20,787,800
Fukien	15,000,000	7,000,000
Chekiang	2,300,000	1,050,000
Total Tons	555,196,000	245,107,800

If we include the 300 million tons of scattered and unimportant sedimentary deposits, we find that China has about one twenty-fifth of the reserves of the world, one-fourth that of America, eight-tenths that of England and one-third that of France or Germany before the war. Looking from another angle, if we should take the per capita consumption of iron in China to be equal to that in the United States, that is 600 pounds per capita, based upon pre-war production, we would have to face the consequence of exhausting the 900 million tons of ore in about four years. Again let us inquire into the iron ore reserves of China in relation to the area of the country. It has been assumed, first by Sjorgren and then by Eckel, that the resources of iron ore of known countries are proportional to their areas, that is 1,646 tons of ore per square mile of territory. Now, taking the combined areas of China proper and Manchuria to be 1,896,000 square miles, we should expect to have, according to the above assumption, about 3,120,000,000 tons of iron ore as reserves. In reality there are only about 900,000,000 tons, that is about one-third or one-fourth what there should be. The annual production of pig iron by the modern furnaces in China will soon reach the 1,000,000-ton mark, if the iron market continues to improve and if the concrete proposals that have been made soon materialize.

The following is a list of iron works existing or proposed, with their maximum production and their present production:—

Name of Company	Locality of Furnace	Maximum Annual Production	Estimated Production for 1923	Remarks
Han-Yeh-Ping Co. ...	Hanyang ...	216,000	100,000	
Han-Yeh-Ping Co. ...	Tayeh ...	324,000	90,000	
Liu-Ho-Kou Mining Co.	Hankow ...	36,000	30,000	
Pen Hsi Hu Coal & Iron Co.	Pen Hsi Hu, South Manchuria ...	91,000	20,000	
Lung Yen Co. ...	Western Hills, Peking ...	90,000	—	Will be blown in next year.
Kai Lan Mining Administration ...	Ching Wan Tao ...	*90,000	—	Under consideration.
Anshanchan	Mukden ...	100,000	*20,000	
Total, Tons ...		947,000	260,000	

It is well known that pig iron is still produced in small native furnaces in nearly all of the provinces of China. An estimate of the approximate production of ore and native pig for the year 1915 gives 499,810 tons for the former and 108,330 tons for the latter.

Regarding the conditions making for the curtailment of production at the present time, I shall have a word to say later on.

The following table shows the chemical composition of the pig iron produced in the various works :—

Name of Company	Si	S	P	Mn
Yangtze Foundry Pig No. 1 (Liu-Ho-Kou Co.) ...	2.50 to 3.00%	0.03% Max.	0.05 to 0.15	0.5 to 0.7
Han-Yeh-Ping Co., No. 1	2.0 to 4.0 %	0.03 to 0.08%	0.25 to 0.33%	0.60 to 2.00%
Pen-Hsi-Hu, No. 1	——	.012 to .047	0.07	0.40

Regarding the cost of mining iron ore in China, it is apparent that this will vary according to location and type of ore deposit. Let us take the Tayeh Iron Mine as a representative type of mining on a large scale. The cost of mining and transportation (about 28 km. from the mine to port of shipment) was about $1.00 Mex.† per ton in 1913, itemized as follows :

	Taels
Salary	0.154
Labor and material	0.241
Transportation	0.074
Loading	0.112
Miscellaneous	0.143
Total	0.724—approximately $1.00 Mex.

In 1919, due to rise in cost of material and labor and including interest and depreciation, the cost per ton at port of shipment was $2.80 Mex. I presume the present cost varies slightly around this figure.

The cost of mining in the various small and scattered deposits in Hunan, to supply ore to the native furnaces, varied from $0.672 Mex. up to $3.36 Mex. per ton.

It will be interesting to you to know the conditions under which contracts for ore delivery have been made in China. Japan has been the largest buyer of Chinese iron ore, the quantities ranging from 300,000 tons to 600,000 tons per year. Under the terms of an agreement with the Han-Yeh-Ping Co., involving a series of long term loans from Japan, there are specified the following restrictions as to the grade of ore to be delivered, f. o. b. steamer at Tayeh at $3 (Mex.) per ton, with 5 per cent. additional for shortage :—Iron content based at 65 per cent. ; for every increase of 1 per cent., a premium of 10 cents Mex. is given ; for every decrease of 1 per cent., a deduction of 10 cents Mex. ; refusal, if 50 per cent. or less. Manganese content based at .5 per cent. ; for every additional .1 per cent., a premium of 10 cents. Phosphorus, at .05 per cent. ; for each decrease of 01 per cent., a premium of 10 cents ; for each increase of .01 per cent., a deduction of 10 cents ; refusal, if more than .08 per cent. Sulphur, .1 per cent. ; for each additional .1 per cent., a deduction of 5 cents ; refusal, if more than .5 per cent. Copper, .4 per cent. ; refusal if more than .4 per cent. The average sizes of ore should be between 75 mm. and 150 mm. ; and any sizes less than 25 mm. are rejected.

Recently an agreement has been concluded between the Hupeh government mining bureau, operating the Elephant Nose Iron Mines at Tayeh, and the Liu Ho Kou Mining Company, operating the Yangtze Blast Furnace, for the supply of between 60,000 tons and 70,000 tons of ore at $3.60 (Mex.) f. o. b. lighters at Tayeh, under the following terms as to the quality of ore supplied :—Iron content based on 60 per cent. to 62 per cent. ; for every 1 per cent. above 62 per cent., an increase of 10 cents ; for every 1 per cent. below 60 per cent., a deduction of 10 cents ; refusal, if below 50 per cent. Manganese, .5 per cent. ; for every .1 per cent. above .5 per cent. an increase of 10 cents. Silica, up to 10 per cent. ; for every 1 per cent. above 10 per cent., a deduction of 5 cents ; refusal, if above 20 per cent. Phosphorus .05 per cent. ; for every increase of .01 per cent., a deduction of 10 cents ; for every decrease of .01 per cent., a premium of 10 cents ; refusal, if above .1 per cent. Sulphur, .1 per cent. ; for every increase of .1 per cent., a deduction of 5 cents ; refusal, if above .5 per cent. Copper, .2 per cent. ; refusal, if above .2 per cent. The weight of the ore delivered is calculated on the dry basis, with 2½ per cent. additional for shortage. In this connection, I should like to mention the use of the following empirical formula, which has been developed by me, and accepted in principle by the bureau of the mines, for the settlement of the price paid for the ore delivered this year.

Let x = price of pig iron when the original contract was signed.
y = price of ore, agreed upon when the contract was signed.
z = price of pig iron (local market) when readjustment of price of ore is made.
w = a constant.
A = price of ore in $ Mex. delivered f. o. b. Tayeh at the time when the yearly readjustment is made.

$$A = Y - \frac{\left(Y - \frac{Z}{X} \times Y\right)}{W}$$

In this case X = Tls. 70, being the local price of pig iron in 1919 when the agreement was signed : Y = $4.10 being the price agreed upon at that time : Z = Tls. 35, being the price of pig iron at the beginning of this year : W = 4 arbitrarily fixed, since the cost of ore for one ton of pig iron is about one-quarter of the total cost of smelting.

$$A = 4.10 - \frac{\left(4.10 - \frac{35}{70} \times 4.10\right)}{4}$$

= $ 3.588 (Mex.) say $3.60, which is the ruling price for ore finally agreed upon for this year.

I do not know whether there is any such formula for the adjustment of price of iron ore in America.

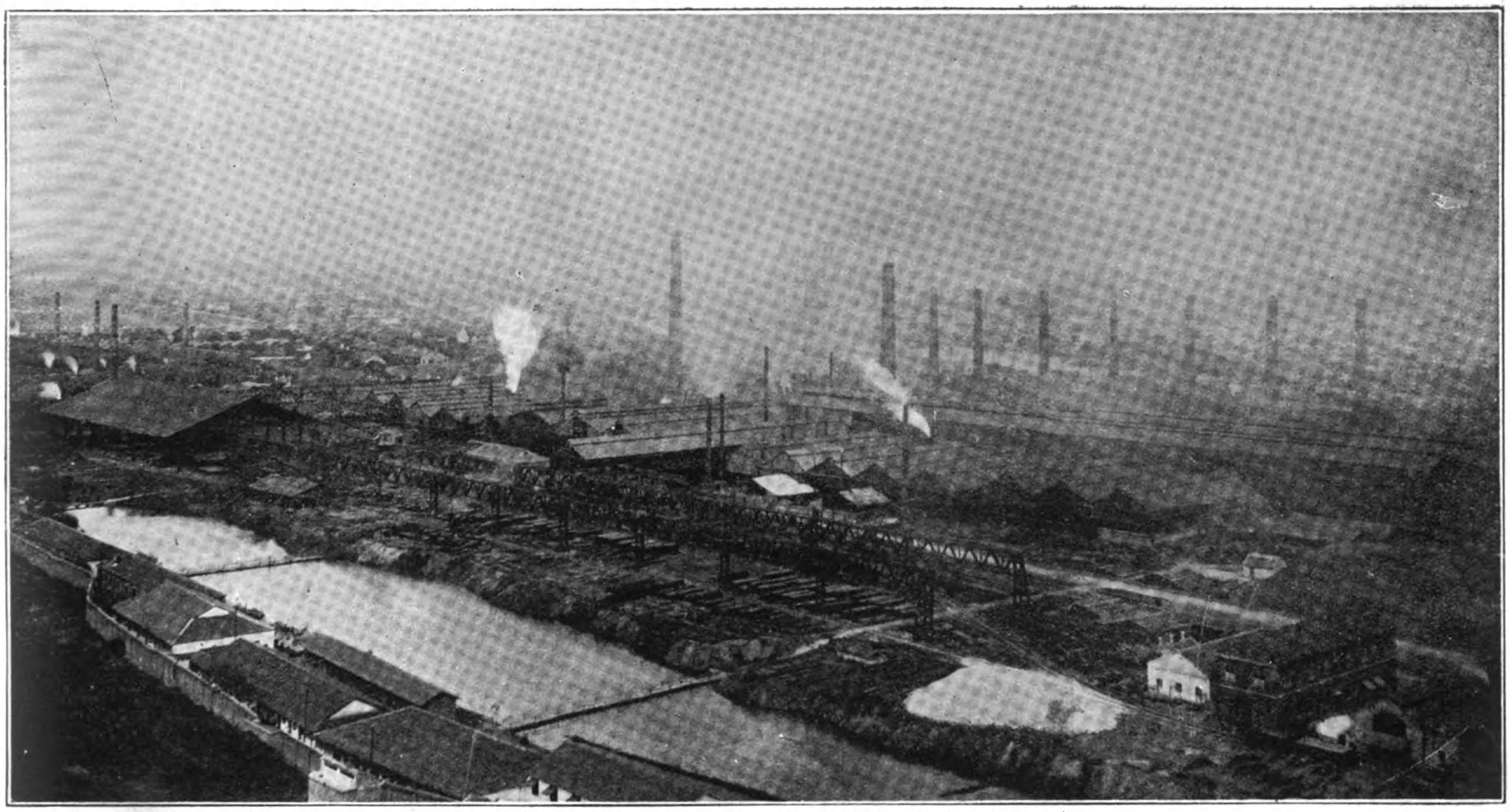
Cost of Iron Manufacture in China

Cost is a thing very fluid, and is not easy for one to hold for any length of time. It varies from time to time as it depends upon so many variables. So with the cost of iron manufacture in China, as well as elsewhere. Its usefulness lies in giving us a comparison and in the forecasting of future costs.

The following table gives at a glance the costs of iron manufacture in China, as compared with that in the United States :—

Raw Materials	Tons	Liu-Ho-Kou Mining Co. (Yangtze Furnace)	Hanyang	Penhsihu	United States
		1923 Gold $	1920 Gold $	1921 Gold $	1923 Gold
Iron ore	1.61	3.94	3.33		9.50
Manganese ore ...	0.02	0.14	.33		
Limestone	0.40	0.32	.46	14.83	1.25
Coke	1.11	10.76	13.46		10.50
Scrap		—	.18		—
Total		$15.16	$17.76	$14.83	$21.25

*Estimated.
†1.00 Gold $2.00 Mex.-Ts. 1-45.



GENERAL VIEW OF HANYANG IRON AND STEEL WORKS

Labor	0.55	0.28	1.26	1.75
Supplies and stores ...	0.30	0.12	—	
Repairs and maintenance	0.28	0.19	1.29	
Replacement of tools .	0.03	0.36	—	2.00
General expenses ...	2.60	.96	3.82	
Financial expenses ...	2.80	3.60		
Power	—	0.62	1.28	—
Total	$21.72	$23.89	$22.48	$25.00

From the above it is apparent that at present China can produce pig iron more cheaply than the United States. On the whole, the cost of raw materials as well as the cost of labor is lower in China, while the purely manufacturing cost is lower in the United States. I am not sure whether the financial expenses are included in the total figure for the United States as given in the above table.

The number of man-hours per ton of pig iron at the Yangtze Blast Furnace is on an average about 17 as against between 1.72 and 6.2 in the United States, although the labor cost per ton of pig is cheaper in China. This points to a moral: cheap labor is always inefficient.

Let us examine the assembling cost of raw materials per ton of pig.

	Yangtze Blast Furnace, 1923 Gold	Valley Furnace (U. S. A.), 1920
Coke	$3.64	$ 2.77
Limestone	0.18	0.42
Ore	1.04	6.47
Supplies	—	0.50
Taxes	—	0.31
Total	$4.86	$10.47

The above figures require no comment.

The present depression of the pig iron market in China is an after echo of the world trade depression, although the panic in Japan two years ago has added its effect upon it. I have reason to believe that under existing conditions, China cannot consume more than 100,000 tons of modern furnace pig iron and so the excess of production has to depend upon the Japanese market, which, in fact, indirectly controls the local Chinese market. The price has grown more and more shaky every day. Since the cutting down of prices by the Han-Yeh-Ping Co. a few months ago, even the price of Tls. 33.00 fails to interest any buyer at Hankow. Buyers are adopting a "watchful waiting" policy. The same condition prevails in Shanghai, where buyers are not eager to place orders at Tls. 36.00.

Owing to financial stringency, the Han-Yeh-Ping Co. has been shipping its stock to Japan even at a loss. At present Japanese buyers are not eager to place any order even at as low as Tls. 29.00, f. o. b. Hankow. This condition of affairs is indeed gloomy. It would appear that the best way for China to get out of this apparently hopeless situation is to have more steel works established, big enough to absorb the pig iron produced, otherwise she will be obliged to rely upon the Japanese market, where Indian pig iron is trying hard to undersell Chinese pig iron. May the man at the helm of this industry have a wide vision of the situation!

Steam Power Reserve Plants Operating in Japan

CONTRARY to all calculations the demand for electric power in Japan has increased to such an extent that there will be no excessive surplus during the first half of 1924. Hydro-electric companies have commenced to operate their reserve steam plants in order to make up the shortage of power caused by the diminished volume of water in the lakes and rivers about the middle of January. Companies operating steam power houses are:

Daido Electric Power Company:
- The Kasugade No. 1 power plant, 15,000 k.w.
- ,, No. 2 power plant, 10,000 k.w.
- Kema power plant .. 10,000 k.w.

Ujigawa Electric Power Company:
- Fukuzaki power plant.. 10,000 k.w. (4 sets)
- Imazu power plant .. 10,000 k.w. (2 sets)

The Osaka Municipality:
- Kujo Power Plant .. 1,500 k.w. (3 sets)
- Ajikawa Power Plant .. 3,000 k.w. (2 sets)

Iron Ore in the Netherlands East Indies

With Some Further Considerations on the Establishment of an Iron and Steel Industry

By J. Van Der Waerden, C.E., Member of the Government Industrial Committee

AMONG the readers of this paper it is probable that few have a comprehensive understanding of the mining possibilities in the Netherlands East Indies, that large archipelago, situated between Australia and the Malay peninsula, with a population of nearly 50,000,000. Except for the well-known oil fields of Borneo, Sumatra and Java, and the Banka and Biliton tin mines, little has been published about mineral deposits in the N. E. I. in a language other than Dutch. Herewith is a brief description of the huge iron-ore fields in Celebes and Borneo, discovered four years or so ago, and of the possibilities of developing an iron and steel industry.

When, at the outbreak of the European war, Neth. Indies dependence upon other countries was strongly felt, the government put the question to the bureau of mines if there is a sufficient supply of iron ore in the Indies to justify the founding of an iron and steel industry. After a close investigation of the fields already known, a sorting out took place, and it was arranged that Java and Sumatra should not be investigated any further. Although along Java's south coast, between Tjilatjap and Banjumas, extensive iron ore sand fields are met with, the quality of the ore is such that an economical exploitation of the same is out of the question. As regards the iron ore deposits of the Lampongs in Sumatra may be mentioned that the ore is of the very good quality, but the supply amounting to about 2 million tons is too small for a large scale iron industry.

Lake Matano: In the foreground, Limestone Mountains; in the background Mountains with Nickel Deposits

So Celebes and Borneo remained for further investigation, as on account of certain geological characteristics it was to be expected that in these islands large amounts of ore were to be found, and from times of the East Indie Company it was known that the people in central Celebes manufactured exceedingly good swords from ore that they obtained in the vicinity of the Matano lake.

These governments' investigations have brought about that in the archipelago the two most important ore deposits are the one in central Celebes and the other in southeast Borneo.

These ores belong largely to the same class as the well-known Cuba ores (Mayari). In relation to their origin these ores are found on the surface and can therefore be obtained by means of so-called open outputs.

In *Celebes* the ore occurs in the vicinity of the lakes, more especially the Larona field ; and where the lateritic ore deposit consists of a thin layer of loose ore gravel and lumps. Underneath this there is sometimes a layer of solid ore, followed by fine granular ore and iron clay. The hard and soft ores have materially (chemically) the same composition. In the Larona field, about 8 k.m. long and 1½ k.m. broad, an ore deposit has been indicated and estimated of about 370 million tons iron clay (soft ore) and about 12 million tons lump ore (hard ore).

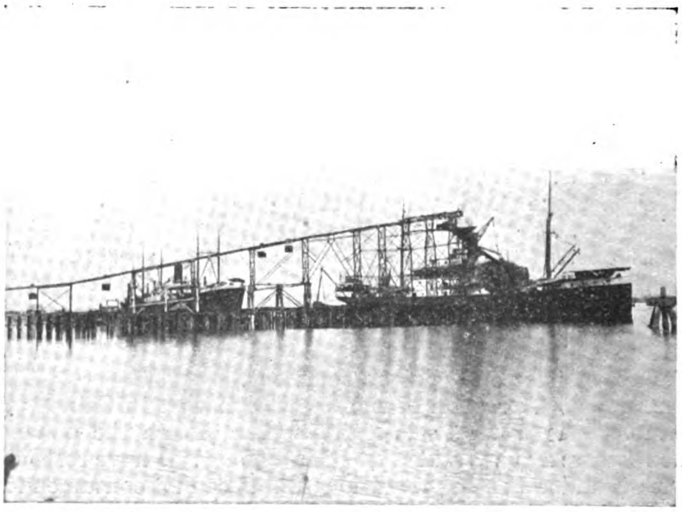
The physical properties of the iron clay make it unsuitable for transport (export) unless "sintering" (nodulising) is first done. The cost of this for Celebes is estimated at 2 to 2.50 guilders per ton (Cuba : 0.80 to 1 dollar). An advantage of this process, however, is that it drives out volatile parts, thus decreasing the cost of transport in relation to iron percentage and quantity. For smelting on the spot, this physical objection to the soft ore is of minor importance.

The analysis of average samples of easy accessible iron ores at the Larona field gives :

Si02	=	2.02	%	
A1203	=	5.00	%	
Mn0	=	1.03	%	= 0.80 % Mn.
Fe03	=	68.30	%	=47.80 % Fe) 49.09 % Fe
Fe0	=	1.66	%	= 1.29 % Fe)
Ca0	=	0.73	%	
Mg0	=	0.07	%	
P205	=	0.094	%	= 0.041 % P.
S	=	0.096	%	
Loss on ignition	=	18.15	%	
Cr203	=	2.46	%	= 1.69 % Cr.
Ni0	=	0.39	%	= 0.30 % Ni.
		100.000	%	

In *Borneo* the iron ore deposits are found in the southwest slope of Mt. Koesambi-or Koekoesan, also named the Soengei Doewa

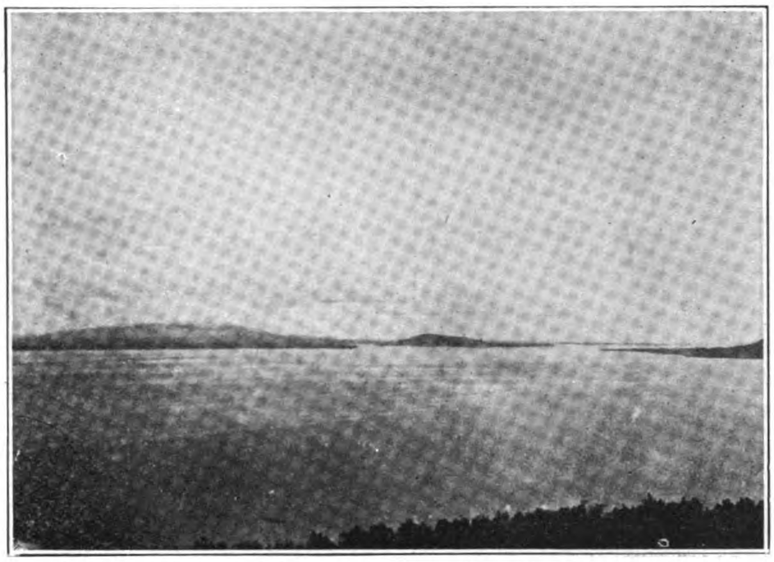
The Coal Centre Pulu Laut, is the Isle of Laut on the S. E. Coast of Borneo



Loading Coal at the Wharf of the Pulu Laut Mine

field. The question as to whether these are of other than lateritic origin has not been solved. The deposits found are between altitudes of 50 to 100 metres above sea level, principally in the form of solid bank, covering an area of several square kilometres. Higher up, on the crowns and the less steep slopes of the mountain ridges, this bank breaks up into a few ruptures of great content, and, in addition thereto, smaller more rounded off blocks and a sort of granular ore gravel are found up to a height of about 300 metres, the whole being outlined by a border clearly perceptible.

The ore mass is brown (in contrast with the blacker Larona (Celebes) lump ore), amorphous and dense; the structures found seem to indicate "metasomatic" ore deposits. The stock of ore of that part of the Mount Koekoesan not covered with sedimental layers is estimated at 100 million tons of hard ore, lying on the surface, with an average of 48 per cent. of iron; the area of this bed is approximately 17 square kilometres.



Southern Entrance of the Laut Straits. View from Mt. Semiaran. In the centre is Soewangi Island; at the left Mt. Koekoesan

Under the tertiary sediment is found a green, less rich ore, the value of which as well as the quantity it is impossible to estimate and may therefore better be left out of consideration.

The bank ore of Soengei Doewa shows the following chemical analysis :—

SiO_2 ..	4.53 %	
Al_2O_3 ..	10.50 %	
Mn_3O_4	1.20 %	0.86 % Mn.
Fe_2O_3 ..	69.00 %	48.3 % Fe.
MgO ..	0.27 %	
P_2O_5 ..	traces	
S ..	0.16 %	
Loss on ignition	12.09 %	
Cr_2O_3 ..	1.40 %	0.95 % Cr.
NiO ..	0.85 %	0.66 % Ni.
	100.00 %	

Transport Conditions

The deposits in *southeast Borneo* are more favorably situated for exploitation than the lateritic ores of *south Celebes*. The ore deposits on the slopes of Mt. Koekoesan may easily be connected up with the coast (Straits of Laoet) by a railway line. This line of 15 kilometres would have its terminus in the mountain at an altitude not exceeding 50 metres above sea level, where a continuous layer of hard ore is reached with an average thickness of 6 metres in a comparatively small area of $2\frac{3}{8}$ square kilometres, containing a stock of ore of about 40 million tons.

In *Celebes* the conditions are that the principal ore deposits lie around the higher lakes, the shortest distance (by aerial line) from the coast (Gulf of Boni) being 28 kilometres, the distance measured along the river (Larona-Malili-Lampea) 50 kilometres.

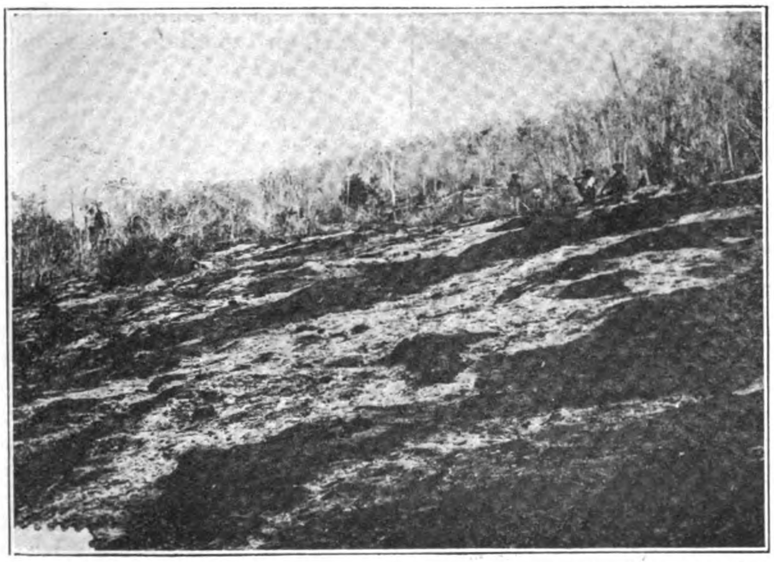
The natural entrance (be it out of the way) to these ore deposits is formed by the cleft of the Larona, which is the outlet of the lakes. As a port of shipment, Oesoe bay offers itself, more especially the "Iron Bay" south of Lampea. It appears possible to develop a railway route from the Larona field to Iron bay. It also appeared possible to trace a cable transport system (aerial ropeway) which, from the Larona ore field to the coast, would have a length of about 32 kilometres, crossing an intervening saddle of 460 metres high.

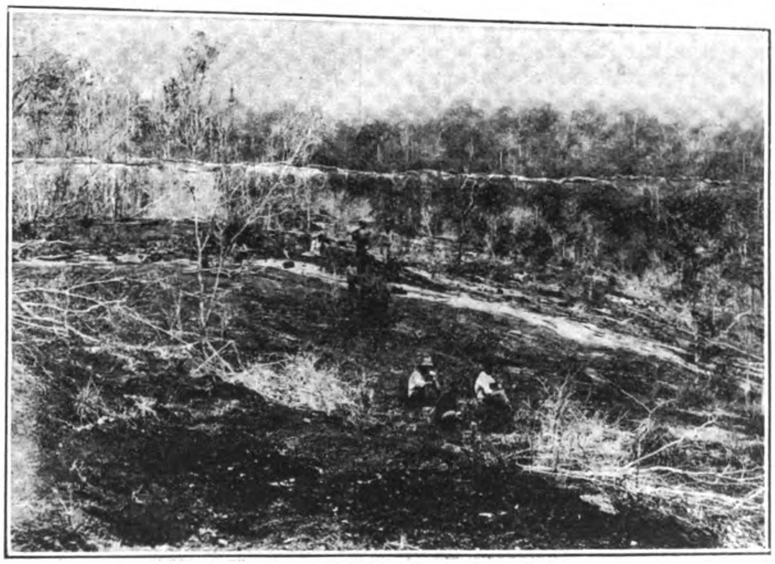
Whereas in *Borneo* the means of transport (a railway is cheaper here than an aerial railway of large capacity) for the iron ores require a capital outlay of about 700,000 guilders, the 38 kilometres long railway (25 pro mille) for *Celebes* is estimated to require not less than 6,000,000 guilders.

Utilization

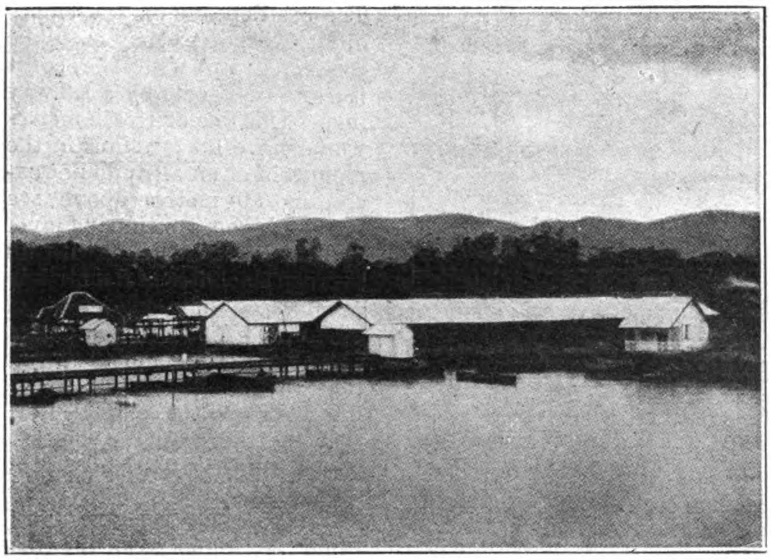
The iron ore deposits lend themselves in the first place for ore mining, principally working for exportation.

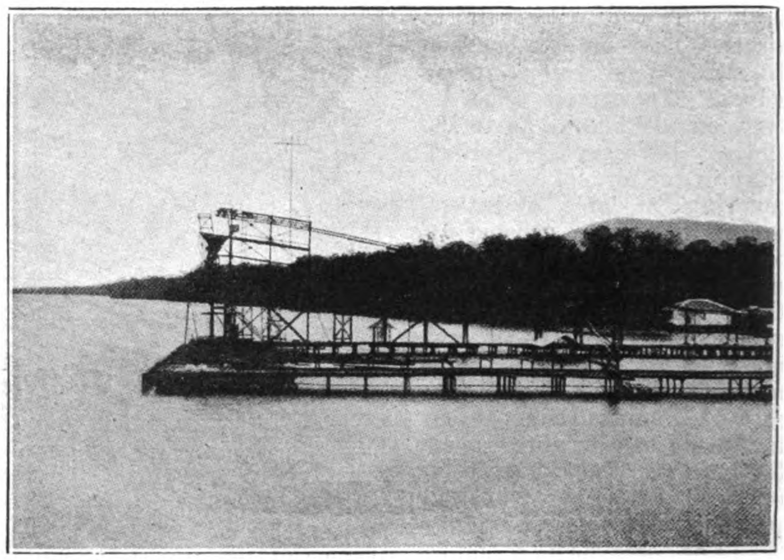
The utilization to their full extent, however, requires the foundation of domestic smelting works (reduction furnaces or





Iron Ore Deposits of Soengei Doewa, S. E. Borneo





Coaling Station at Pulu Laut

electro-thermic smelting) and finally of steel plant (rolling mills, etc.)

For an export business southeast Borneo is preferable.

As far as the value of the ores for metalurgical manufacture is concerned, no difference need be made between Borneo and Celebes ores, even though the analyses (chemical composition) and also the mineralogical structures differ slightly.

Under the conditions prevailing in *Celebes*, an ordinary blast furnace plant (coke blast furnaces) is practically excluded ; and owing to the enormous hydraulic power present in the Rona river and on the other hand, the lack of coal and coke in the neighborhood, need not to be considered.

The expert reports advise electro-thermal treatment here, that is to say, a complete electro-metallurgical plant with electric shaft furnaces of the charcoal type.

Similar calculations have been made for *Borneo*, but instead of taking charcoal as the reducing material, it was possible, in view of the coal deposits at Poeloe Laut, and those in the vicinity of the iron-ore field, to reckon on an adequate, if less hard and therefore not rich, supply of coke. (The coke used in an electric furnace may be of much lower quality than that for use in the ordinary blast furnace).

In view of this, electric furnaces were designed of the coke type, i.e., with very low shafts. Owing to the very favorable conditions with respect to the coal deposits of Soengei Doewa (below and in the neighborhood of the iron-ore field, electricity can be generated on the spot in a steam-power station at a cost of one cent, Dutch currency, per kilowatt hour, thus not dearer than that of a water-power station in Celebes. Consequently, the advantage that Celebes seemed to have above Borneo up to the present, owing to its natural hydraulic power, disappears. While Borneo with a steam-power station would have the advantage as regards cost of construction (the cost of erecting a hydraulic power station is three to four times higher).

The cost of producing pig iron in an electric shaft furnace plant in Borneo, is lower than in Celebes.

Although, as against prices of 35 to 42 guilders per ton pig iron, which must be taken as the prices for America and Europe, a competitive electric smelting industry cannot be founded in Borneo even after allowance has been made for the advantages in freight and local markets (averaging 6 guilders per ton), the chances of success in founding such works in Borneo are much more favorable than in Celebes. Prime cost plus advantage in freight approximate very closely to the prices obtained in Europe and America.

A blast furnace undertaking in S.E. Borneo, however, would be in a stronger position if a good metallurgical coke were available on the spot for the reduction of the iron ore in the standard type of coke blast furnace.

Calculations based on complete schemes have demonstrated that in this case good results might be expected.

A coke blast furnace plant in S.E. Borneo would under the conditions summarised, supply a product at a price equivalent to that of the world market, i.e., the production cost in Europe and America.

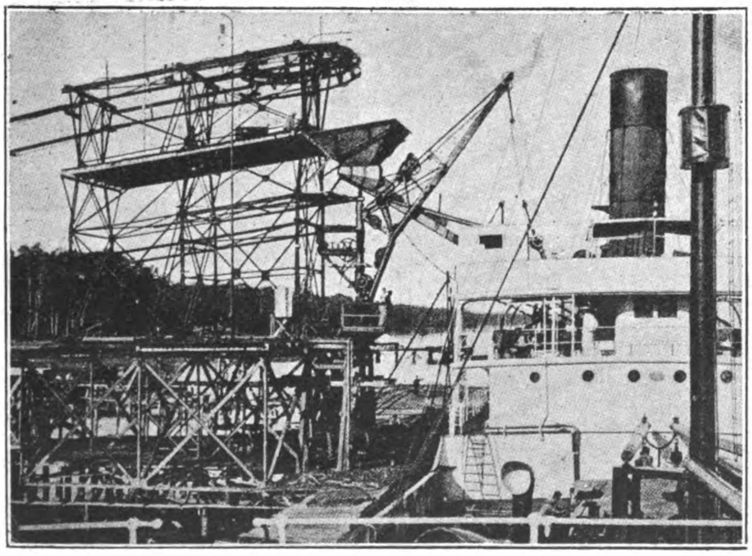
Meanwhile, the composition of the pig iron obtained from the Borneo ores (unserviceableness as cast iron) as well as the scanty possibility of further manufacture in establishments in East Asia, combined with the favorable freight conditions in exporting outside east Asia, indicate that the manufacture of the raw and half-finished products can be better entrusted to blast furnace plants in the Netherlands East Indies themselves ; or in other words, operations cannot cease at the production of pig iron, since only further refining can guarantee the certainty of a market abroad and at home. For rails, profile iron and plates, etc., a good market may be expected in the Netherlands East Indies and vicinity ; on the other hand, for a not common pig iron there is little or no market.

The last phase for a domestic iron industry, the local rolling of the product into rails, profile iron, bar iron, plates, etc., will therefore have to be considered.

The situation of works in southeast Borneo for supplying the archipelago and for shipping products abroad, is much more favorable than in central Celebes or on the Gulf of Boni. The cost of constructing rolling mills is the same in both islands. The further manufacture in *Java* instead of in southeast Borneo of the pig iron, on the other hand, could be considered if it were not for the fact that all the advantages, such as the driving of the motors with the gas from the blast furnace and coke plants, as well as the advantage of a local steam electrical power station near the Soengei Doewa field (with the coal from there) would then be abandoned.

Carefully worked out schemes for a complete blast furnace and steel plant and rolling mills, and calculations based thereon, have demonstrated that it must be possible to manufacture rails, profile iron and bar and plate iron at a competitive price. With a

(Continued on page 129)

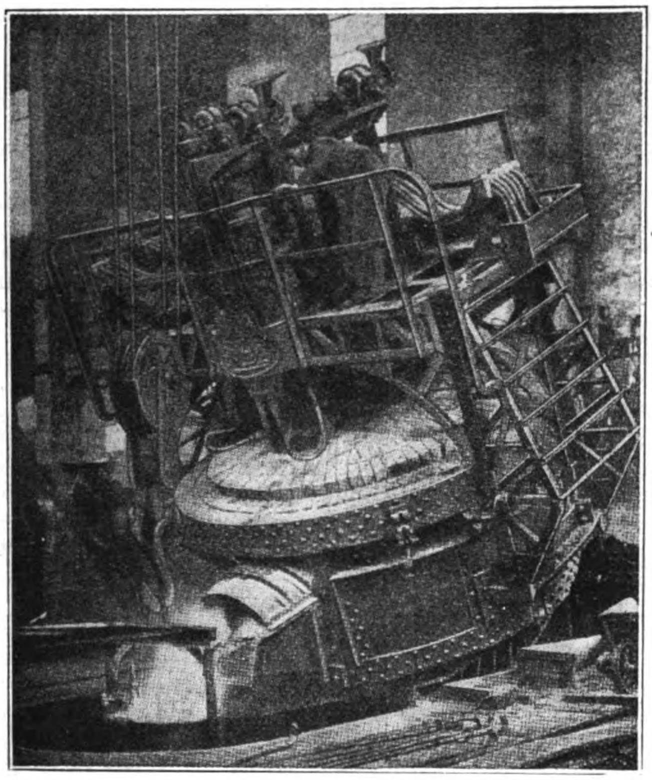


Loading Station at Pulu Laut

Electrical Furnaces for Shanghai

THE article on "Shanghai as a Field for Electric Furnaces" by Mr. Lansing W. Hoyt, the American trade commissioner, which appeared in the June (1923) number of THE FAR EASTERN REVIEW, has attracted considerable attention in the British and American iron and steel technical press which recognizes the peculiarly favorable situation of this port for the development of such an industry by reason of the cheap supply of electricity coupled with an over supply of cheap labor. There is little doubt that the time is not far distant when the initial steps will be taken to realize a dream made possible solely by the splendid municipal electrical plant which has developed into one of the foremost of the world in point of efficiency of service combined with exceptionally low costs to the consumer.

Various types of electric furnaces are being perfected by manufacturers in American and Europe to meet the ever increasing demands of the high-grade steel industry. *Engineering Progress* says that the total number of electric furnaces of all countries rose from 140 in 1913 to 1,025 in 1920. America and Canada stand



Electric Furnace in Service

for 363 furnaces, England for 160, of which 70 are erected in Sheffield, whilst Germany possesses about 1,000 furnaces. Over 90 per cent. of these furnaces are arc furnaces, the majority of which are of the Héroult type. This type has found favor owing to the minimum capital expenditure and costs for repairs, and great reliability in service. Statistics not only show an enormous increase of electric furnaces during the war, but also an extraordinary increase during the years 1919 to 1920, in spite of the fact that the furnaces, which had been used for war material, had been turned to better account.

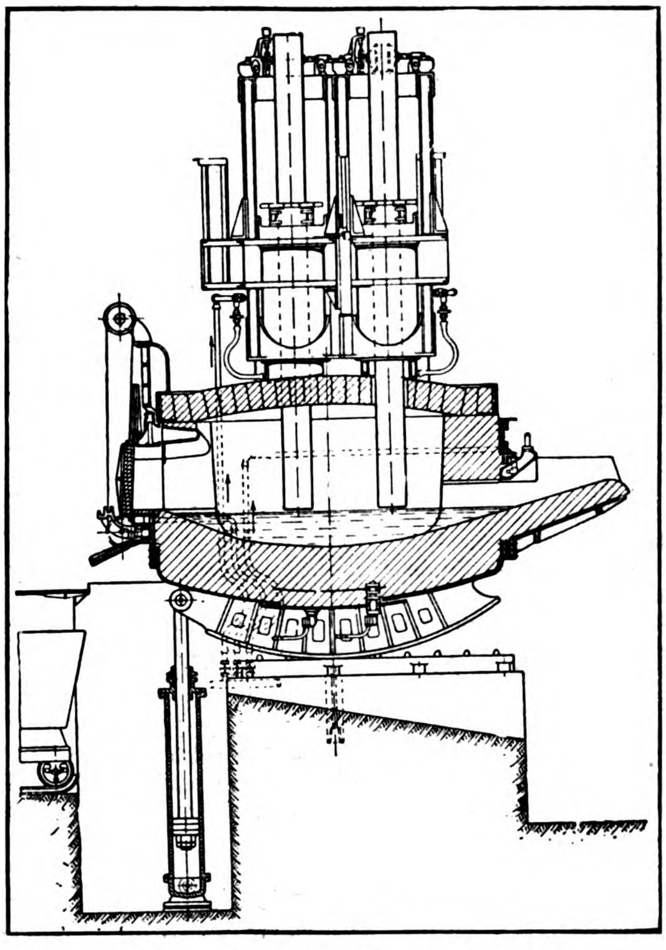
The dearth of iron and coal during the war caused the Fiat Works of Turin to design an electric furnace by means of which it was possible to economically produce the ordinary kinds of steel in large quantities. For some years past the iron foundry of the Fiat Works has employed six furnaces of 5 to 7 tons capacity each; the results obtained with these furnaces were so favorable that Fiat rejected the open-hearth (Martin) furnaces they had originally planned for their forge at Turin and erected a new Steel Works, equipped with fourlarge electric steel furnaces of 15 to 20 tons capacity each and two smaller furnaces of 6 and 3 tons capacity built by the Demag of Duisburg in co-operation with the A. E. G. These electro-steel works will be enlarged by the addition of four to eight furnaces, after removing the old steel works. The increased capacity, the novel method of sealing the electrodes, and the advantages of these Fiat furnaces are worthy of mention and we shall, therefore, give a short description of their design.

Fig. 1 illustrates a 5-ton furnace in service. Tilting in both directions is achieved by means of rockers. Some of the Fiat furnaces are tilted hydraulically, but the furnaces recently erected, are tilted electrically so as to avoid the provision of a special hydraulic plant.

The Arrangement and Sealing of the Electrodes

The arrangement of the electrodes of this three-phase furnace is of special interest. The three vertical graphite electrodes have a diameter of 250 millimetres and with their complete fittings rest on a bridge. Each electrode with its fittings, regulating mechanism and motor is detachable and may be exchanged whilst in service in about half-an-hour, should this be necessary. The bridge carrying the three electrodes is also easily removed.

On removing the bridge, the cover ring with the brick lining can be taken off, so that the fire-brick lining of the cover or the furnace can be renewed without difficulty. The repairs, which are frequently necessary with other furnaces, especially for the thinly lined bow over the door, are avoided in this furnace, because a water-cooled chamber connected with the frame of the door is provided instead of the bow, which enables one furnace being operated 150 times without interruption. The excellent results of this furnace are due especially to the careful and novel method of sealing the electrodes and the cooling of same. (See Fig. 2.) A jacketed cylinder is fixed to the cover, and is cooled with water; this cylinder contains the electrodes. A second cylinder is fixed to the terminal of the electrode, which latter is automatically moved by two motor-driven spindles. This second cylinder moves telescopically and perfectly air-tight over the cooling cylinder simultaneously with the electrode. The sealing is so perfect that it is possible to stand on the bridge when the furnace is in service, whilst with other types of furnaces the violent action of the flames round about the electrodes makes this impossible. The lack of these very unpleasant flames proves, that in the Fiat furnace no cold air enters through the door, or hot air, or gas, escapes at the



Sectional View of Electric Steel Furnace of the Fiat Works

electrodes, and thus no loss of heat or current is possible, as is the case with other systems. A great saving in electrodes and current is also due to the non-combustion of the electrodes at their exit from the furnace.

The Furnace Transformers

The special three-phase transformers used for the Fiat furnaces have an output of 6,000 kva for each 15-ton furnace, of 1,800 kva for the 6-ton furnace and of 1,000 kva for the 3-ton furnace. The 6,000 kva transformers are of the shell type, the 1,800 and 1,000 kva transformers of the core type. All transformers are oil-cooled, *i.e.*, the oil is circulated by a pump from the transformer oil tanks through a cooling device and back to the transformers. A very efficient circulation of the oil in the transformers is thus set up which ensures perfect cooling of the windings and iron cores.

The primary winding is designed for 22,000 to 21,500 volts, and has terminals outside of the ol vessel to permit altering the connections from delta to star. The secondary winding is star-connected. The neutral point of the transformer is metallically connected with the bottom of the furnace, and is also earthed to limit the pressure between the electrode terminal and the metallic parts to 75 volts.

The secondary winding produces 130 volts pressure when the primary is delta-connected, and 75 volts when the primary is star-connected. Both pressures are line voltages. The furnace is operated with these two pressures; the 130-volt pressure is employed to smelt the solid contents of the furnace and to supply a maximum amount of energy to the furnace during this part of the process. Later on, the 75-volt pressure is applied to purify the bath and to maintain it at a temperature of 1,750° Centigrade.

The secondary circuit is provided with the current transformers for the measuring instruments, and the automatic regulator for the adjustment and maintenance of the energy supply for the arc. All other measuring, controlling, recording, switching and safety apparatus are connected up in the primary circuit.

The complete transformer plant is located in the immediate vicinity of the furnace in a room situated underneath the furnace, in order to minimize the length of the cables as much as possible.

The advantages of the Fiat furnace, proved by many years' service and numerous tests, are the following:

Short duration of smelting process; materially increased output with solid charge, up to 100 per cent.; diminution of the electrical and radiating losses; increased efficiency of the furnace (630 to 700 kilowatt hours per ton of cold charge when producing cast steel in the 5-ton furnace); diminution of the combustion of electrodes, 3 to 5 kilos. of graphite electrodes per ton of steel; protection of the fire-brickwork of the cover; saving in deoxydizing material, wages and expenses due to the increased output of the furnace.

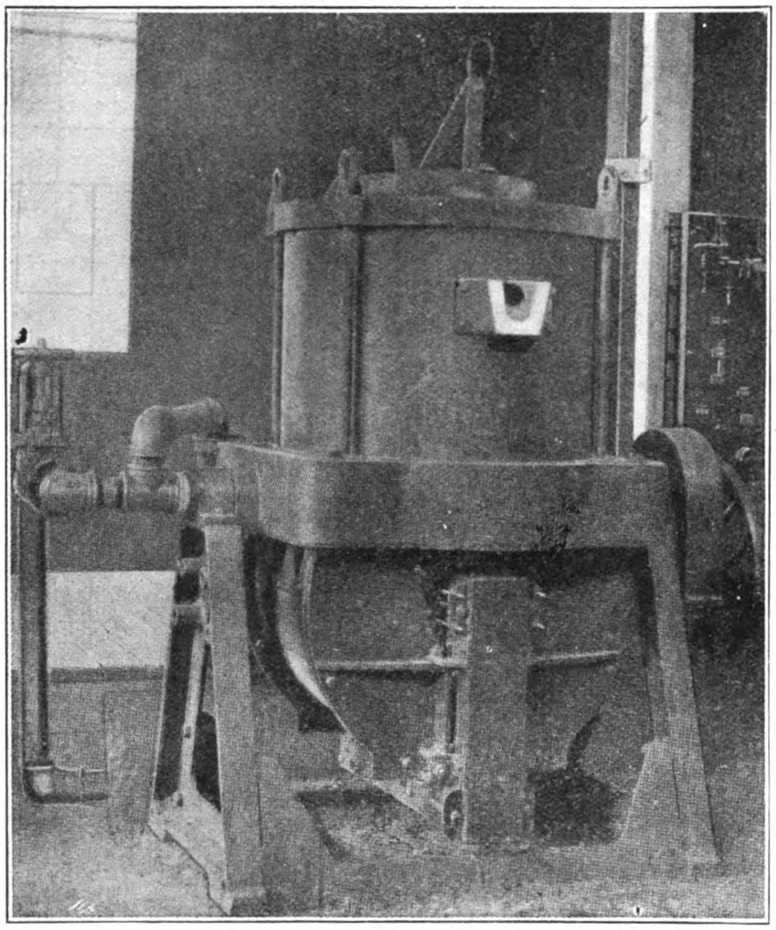
The General Electric Furnace

In the United States the General Electric Company has developed a repulsion induction type of electric furnace for melting non-ferrous metals which is specially adapted for the smaller foundries and machine shops scattered throughout the settlement. Fundamentally, the furnace is a transformer in which the secondary winding is a single turn of metal which becomes so hot from the current passing through it that it melts. Being enclosed within a narrow channel it retains its original circular shape about the transformer core and primary, so that it continues to carry current in its molten condition. This melted metal comes in contact with the metal (in scrap or ingot form) with which the furnace is charged, and the latter begins to melt from the heat imparted and to flow into the secondary duct, replacing the original "winding." This flow of molten metal is produced by a very simple method, based on certain transformer characteristics.

Transformer engineers have been at times unpleasantly impressed by the tendency of transformer windings to assume such antipathy for each other as to cause violent efforts on the part of each to leave the other's company rather than living quietly side by side. This antagonism is compensated for in an ordinary transformer but is deliberately encouraged in the furnace and is the reason for the word "repulsion" in its name.

By simply locating the primary coil in a position to develop the mutual antipathy, the flowing metal in molten state takes on an animated motion which as the metal in the furnace body melts, extends through the whole mass and keeps it in a state of agitation. This action is what is needed in a furnace as it insures a thorough heating and a thorough mixing.

The illustration and the following description will give to those interested in the subject, technical information on this contribution to foundry practice.



The Transformer Construction of the G. E. Repulsion Induction Furnace is evident from the Laminated Core in Lower Section

The repulsion induction furnace has been developed to meet the demand for a highly efficient electric furnace for melting copper and all brasses and bronzes.

Wherever this furnace is applicable, it provides the most economical means of melting, on account of its high thermal efficiency, rapid melting rate, continuous automatic stirring, and low metal loss.

A new and important feature of the furnace is the "pre-formed" lining. Three refractory forms comprise the main lining. These forms are cemented together to form the main holding crucible at the top of the furnace and the heating chamber in the lower section. Suitable heat insulating material is placed between the formed lining and the steel shell. A lining can easily be completely removed, and a new one inserted and made ready for operation in three days. The standard lining will operate successfully up to a temperature of 2,500 deg. F. (1,370 C). The life is long and replacements relatively inexpensive.

The furnace has a holding capacity of 1,200 pounds of molten brass and a pouring capacity of 750 pounds. The balance of 450 pounds must be kept in the furnace in a molten condition at all times unless a source of liquid metal is available for priming. The radiation loss is so small that only a small amount of current is necessary to maintain this bath molten during periods when the furnace is not in production. Furthermore, the furnace needs practically no attention during these intervals. Periodical inspections are all that is necessary.

The furnace is rated 75 kw. single phase at approximately 75 per cent. power-factor. It may be built for operation from any

standard 220-, 440-, 550-volt alternating-current circuit. For voltages higher than these a step-down transformer can be used. The load is very steady and is practically free from fluctuations.

Operating continuously at full capacity the furnace will easily melt 750 pounds of clean, yellow brass (60 per cent. copper, 40 per cent. zinc), ingot or scrap per hour. Under these conditions the power consumption will not exceed 200 kw.-hr. per ton of metal melted and the metal loss will not exceed 1 per cent.

The electrical equipment is very simple and consists of an auto-transformer and control panel. The auto-transformer is arranged for mounting on the back of the panel and is provided with taps for various voltages so that the power input and consequently the temperature in the furnace and the melting rate are controllable. On the front of the panel are mounted the necessary instruments together with an air circuit breaker and a tap selector switch for obtaining the desired voltage at the furnace terminals. The whole equipment is compact and requires very little floor space.

The core and coil constitute the means by which the electric energy is introduced into the furnace, and transformed into heat. The core is constructed of non-ageing transformer steel laminations, assembled in two sections which are fitted with butt joints and bolted together. In designing the coil particular attention has been paid to securing an electrical insulation that will withstand high temperatures, and it has withstood temperatures of 1,100 deg. F. (593 C.) for hours without damage.

For cooling the coil approximately 500 cubic feet of air per minute at 3 oz. to 6 oz. pressure is required. If such an air supply is not available, a small motor-driven blower set can be furnished.

Iron Ore in the N.E.I.

(Continued from page 126.)

normal rate of freight of 11 to 12 guilders to east Asia (the rates of freight prior to 1914 showed this steady tendency for years), the competitive price which may be calculated for the Netherlands East Indies, would be 70 guilders 12 guilders is 82 guilders per ton of steel at the outside, on pre-war conditions.

But it seems impossible, that, seeing the enormous disturbance of the world equilibrium, such a low price will come during the first decennia, so that for an Indian blast furnace plant easier can be expected a minimum selling price of 90 florins per ton, than a lower one.

Steel-works (blast furnaces, steel plant and rolling mills) established in *southeast Borneo*, under the given conditions would, with an annual output of 150,000 tons, be able to supply at such a price and, therefore, offers a safe base for primary and further development.

These results were confirmed by comparative study in Europe and America, and at the same time contract has been obtained with financial groups in Europe and at last with a syndicate in Holland to come to the establishment of an indigenous iron and steel plant.

So in the month of November past the Indies parliament (Volksraad) has confirmed an agreement to be closed between the government of Netherlands East Indies and a Netherlands syndicate on a co-operative base; already in 1925 near the Straits of Laut the construction of the *first* blast furnace in Netherlands India will be started.

New Chinese Financial Commission

Frederic E. Lee, Specialist in Far Eastern Finance, Finance Investment Division

Three times during the past 18 months China has appointed commissions whose principal function was that of bringing order out of chaos in the nation's finances. In July, 1922, Tung Kang, then minister of finance, appointed a national financial commission with Dr. Wellington Koo as its chairman, which was (1) to devise ways and means of meeting the outstanding obligations of the government; (2) to abolish likin and bring about the increase in customs revenues provided for by the Washington conference; (3) to minimize military expenditures; and (4) to work out a system whereby the individuals who keep account of the revenues of the government would be separate from those who actually handle the money. Before this commission had gotten under way the chairman, Doctor Koo, was made Minister of Foreign Affairs and Tung Kang surrendered the portfolio of finance minister.

Again on September 8, 1922, a presidential mandate was promulgated, calling for a national financial conference to meet in Peking to discuss ways and means for the rehabilitation of China's finances. The so-called national financial conference was not supposed to supersede the national financial commission, but was to approach the problem of China's financial status from a different angle.

Both commissions apparently resolved themselves into a national commission for the study of financial problems, under the leadership of Chang Ying-hua, who had been finance minister for a few days following Tunk Kang's régime. Under this commission the plans for the financial reconstruction of China proposed by G. Padoux, adviser to the Chinese government, and of Chang Ying-hua, were produced. These plans gave rise to a great deal of discussion but they contained little that was tangible or constructive.

Financial Readjustment Commision Regarded Favorably

The most hopeful sign in connection with the attempts of the government to restore financial stability is seen in the recent appointment of Dr. W. W. Yen, as chairman of a financial readjustment commission. This new financial readjustment commission, under the leadership of Doctor Yen, former premier and minister of foreign affairs, began work on September 29, 1923, in the president's palace.

According to the Chinese government bureau of economic information, this commission is composed of 15 members, 30 technical experts, 8 secretaries, 20 assistants, and a number of honorary members and advisers. The 15 members are: The ministers of foreign affairs, finance, and communications; the chairman and vice chairman of the board of audit; the director general and inspector general of the maritime customs, the director general of the wine and tobacco bureau; the chairman of the special customs tariff conference preparation bureau; the director general and the associate inspector general of the central salt administration; the ex-chairman of the commission for the study of financial problems; the ex-director general of the financial reorganization bureau; the ex-chairman of the commission for the preparation of a national financial conference, and the governor of the Bank of China, representing the Peking Bankers' Association.

The aims of the commission are (1) to ascertain and verify the actual amounts of the principal and interest of that portion of China's domestic and foreign loans that is not adequately guaranteed; (2) to study the methods of readjustment and redemption of these loans; and (3) to formulate a financial policy for the government after the readjustment, so that its revenues and expenditure will balance. The last item includes also a proper way of separating central and provincial government finance.

The most significant feature of the above aims is that of actually formulating for China a fiscal policy, undoubtedly one of its paramount needs. In the readjustment of China's loans probably a great deal of scaling down will be necessary, particularly, as pointed out by Chang Ying-hua, in such loans as those which bear 74 per cent. interest per annum. It is quite likely that the present financial readjustment commission may have something concrete and definite to offer in the near future in connection with the adjustment of China's indebtedness.

A Sulzer-Oerlikon Plant in China

EXTENSIVE additions to the public service equipment of the French concession are now under construction, including considerable additions to the waterworks and the electric power plant. A four years' program involving an addition of 12,000,000 francs to the capital of the Compagnie Francaise de Tramways et d'Eclairage Electrique de Shanghai is now half finished, and the company is planning large additions to plant during 1924 and 1925.

A new central electric station, constructed in 1921 and 1922, is now in process of further enlargement. In it two 2500 h.p., 2-cycle Sulzer Diesel engines coupled to Oerlikon flywheel alternators with a combined power of 2,500 kva. have been installed, and another much larger motor, with a capacity of 3,300 kva. will be installed this year, while a second of similar capacity will be installed in 1925, making a total of 10,000 kva, greatly superior to the present maximum consumption of the French concession, which is now 3,500 kva.

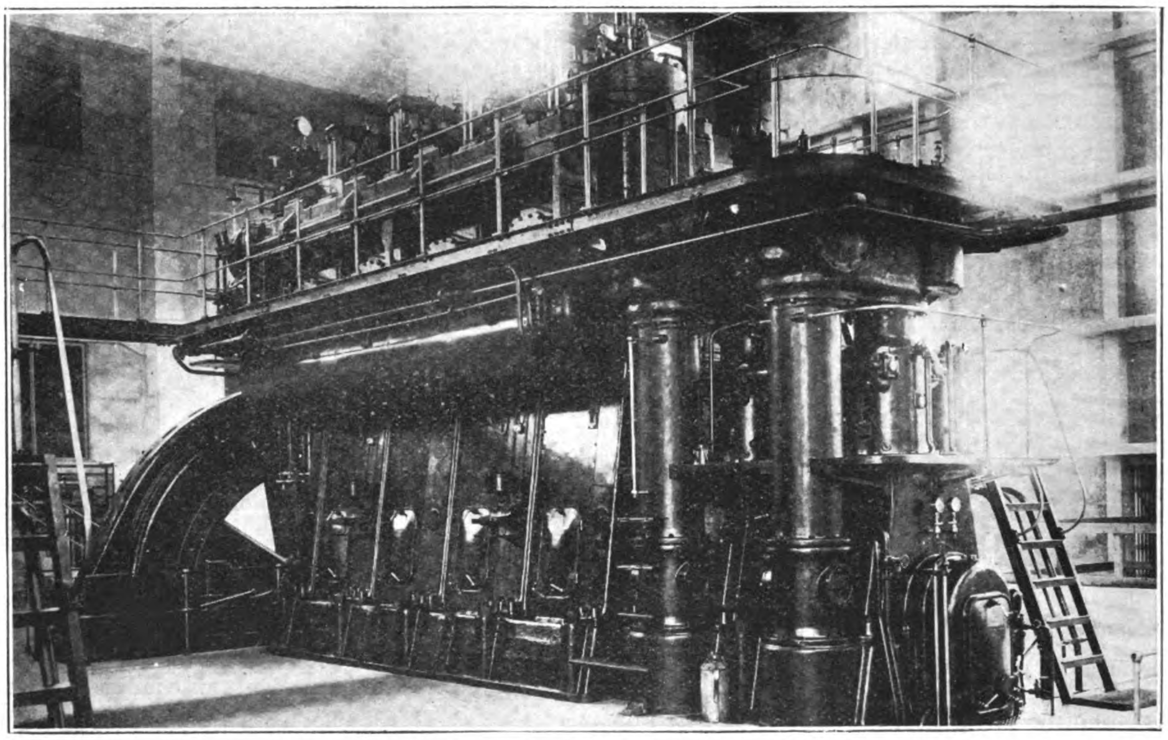
The largest use of the power generated will continue to be domestic, as there are few industrial plants in the French concession, due to the absence of an internal waterway, and to other reasons. The tramways are expected to take something over 500 kilowatts, while street lighting will also take a certain amount of power.

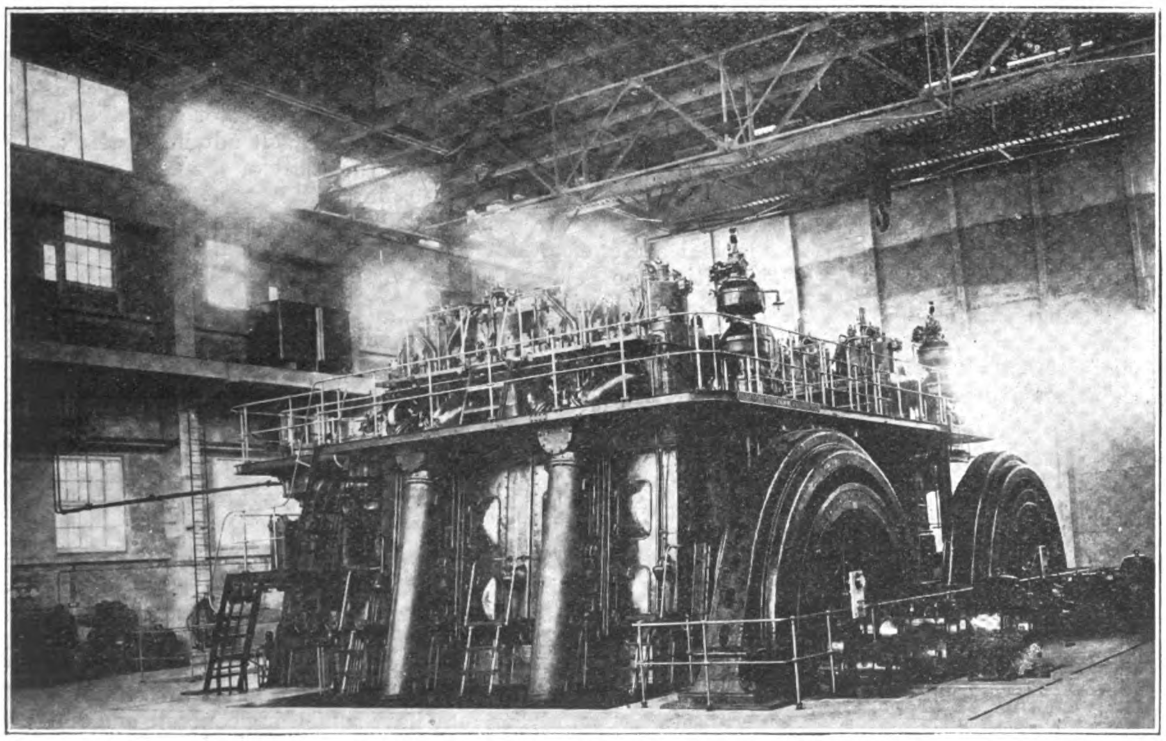
Sub-station transformers all over the concession will step down the current to 200 volts for motors and 110 volts for lights. Six new large transformer stations are to be erected this year throughout the concession; these are in addition to about 15 smaller stations now working.

Twenty kilometres of underground armored cable have been laid and more than sixty kilometrers of bare copper wiring overhead have been strung for streel lighting and domestic use.

The material for the new plant is almost entirely French, except for the Diesel motors of the generating sets which are Swiss, manufactured by Sulzer Brothers. Most of the tenders for equipment have been open to bids from Europe and America. Some of the equipment has been obtained by the Paris office and some here in Shanghai.

In spite of the unfavorable conditions of production in the French concession compared with other larger installations, supplying larger areas, and in spite of the expensive extensions necessary due to the sparseness of the population in the outlying regions of the concession, the company has nevertheless succeeded in selling current at the same rates as other larger undertakings here and elsewhere.

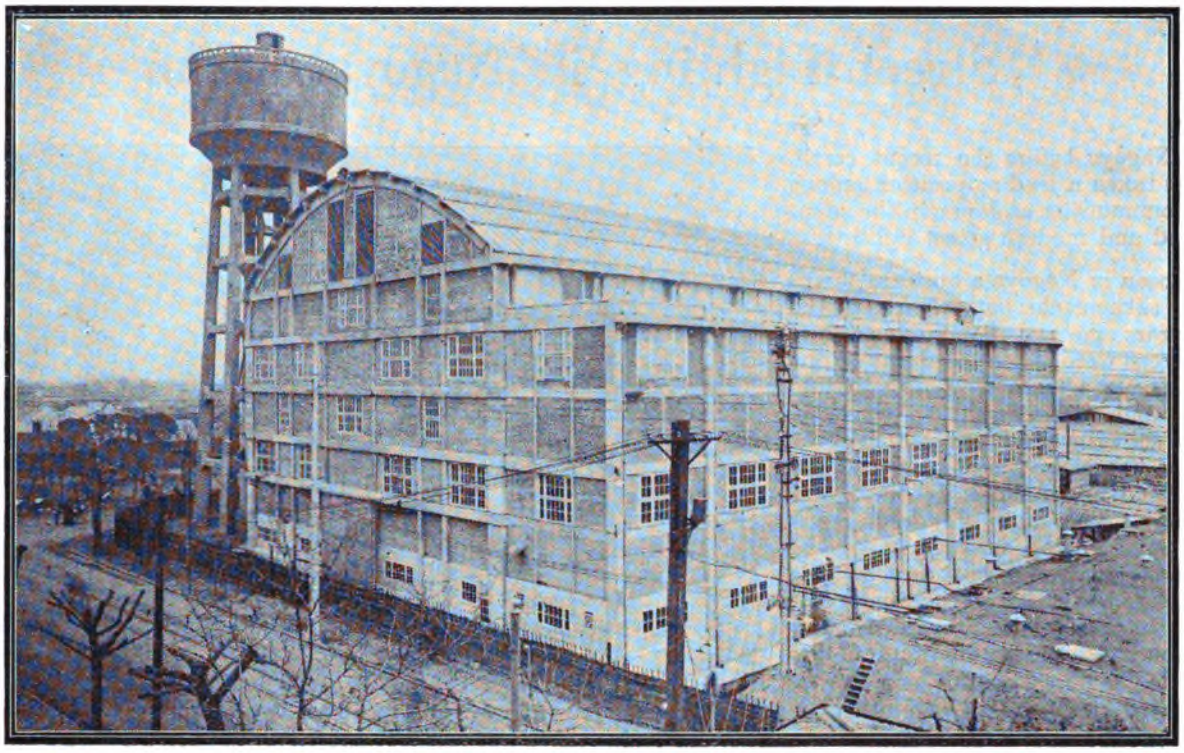




Two 1,500 H.P., 2-cycle Sulzer Diesel Engines coupled to Oerlikon Fly-Wheel Alternators installed in the New Power Station of the Cie Francaise de Tramways et d'Eclairage de Shanghai

Water Supply

In carrying out its program of improving the water supply, the company has constructed a new pumping station taking water from the Whangpoo River. New pre-filters and filters have been constructed, and the total filtering surface has already been doubled, while preliminary alum treated has been adopted by the company. These installations have been made after examination of the most modern European and American plants, and the water now obtained has a limpidity and a clarity which it has never prviously had.



The Power Plant of the Cie Francaise de Tramways et d'Eclairage Electrique de Shanghai

This new generating plant at Lukawei is the central unit in a four years' extension program, of which two years' work has been completed. The third and fourth units are to be installed in 1924 and 1925. The plant is constructed so that it can be extended to the west. The switchboards are on the reader's right-hand side of the building. On the other side is one of the new clear-water reservoirs, with a capacity of 400 cubic metres

The company will also construct this year a supplementary reservoir with a capacity of 4,500 cubic metres, raising the reserve supply of clear water to nearly 10,000 cubic metres, sufficient to provide for a daily consumption of about 40,000 cubic metres.

A new clear-water pump has similarly been installed at Tunkadoo to supply the new reservoir there, which has a capacity of 1,100 cubic metres and will be supplied by a conduit 600 millimetres in diameter and seven and one half kilometres long.

Double Tramway Track

Many new boggie-cars have been added to the equipment of the tram-lines, and these cars have proved very satisfactory for the growing traffic of the company. Owing to the increased traffic upon the Avenue Joffre line, double tracking is being put in, on Avenue Joffre all the way out to Route Say Zoong.

To carry out its ambitious program of extensions the company has a first-class industrial organization of competent and conscientious employees both foreign and Chinese.

The company supplies the French municipality, without charge, with the water for public services and fire-fighting, supplies electricity at half price, and in addition pays taxes, which are increasing each year. The total of its contributions, we are informed, is about one per cent. of the tax-receipts of the French concession.

Increased Capital

The company has made two increases of capital for the carrying out of its four-year program, adding 12,000,000 francs to its previous capital of 8,000,000 francs fully paid up in 32,000 shares of 250 francs apiece. The company was established in 1906 in Paris with an original capital of 3,000,000 francs to take over the existing electric light plant from the French municipality and also to construct tram lines and waterworks. At the time of the transfer the municipality was supplying current to 200 consumers, with 7,500 ten-candle-power lamps. When the company embarked upon its present program, it was supplying 100,000 lights, at high tension of 3,000 volts, which has now been raised to 5,000.—*Shanghai Times.*

Joint Reconstruction of Tokyo

A building construction company is now being projected in Tokyo for the purpose of undertaking "to do civil engineering, construction work and to give loans to building contractors for construction expenses and also to import materials from foreign countries to supply the demand," according to a tentative prospectus received by the far eastern division of the bureau of foreign and domestic commerce from its representative at Tokyo.

This new company is said to include that previously projected and sponsored by the Tokyo chamber of commerce, which was to specialize in the construction of industrial and commercial buildings on the unit basis designed to withstand earthquake shocks.

The new corporation will be known as the "Nichi-Bei Doboku Kabushiki Kaisha," or "Japanese-American Engineers' and Contractors' Corporation," and will be financed and controlled jointly by Americans and Japanese. Head offices will be established in Tokyo with branches in other parts of Japan as may be deemed necessary. The corporation is to be capitalized at 100,000,000 yen ($50,000,000), half of which amount, according to present plans, will be called into the treasury of the company when incorporation is actually effected. Stock certificates are to be issued in denominations of 10, 50, 100 and 1,000 yen, and will be printed in both English and Japanese.

The shares will be divided equally between Japanese and American citizens, it is said, insuring joint control of the venture.

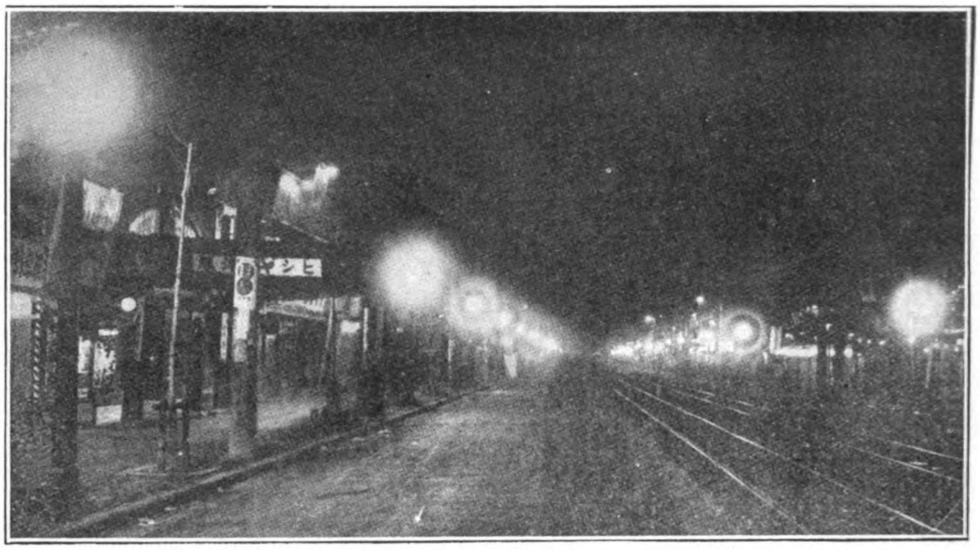
This project differs from the original company planned in that it proposes not only to participate in the work of reconstruction throughout the devastated area but to undertake to carry out building projects in other parts of Japan and the far east and to engage in the importing business.

According to article five in the prospectus the life of the corporation shall be twenty years from the date of establishment, but this period can be lengthened or shortened in accordance with resolutions passed by the shareholders at a general meeting.

Technical skill, machinery, and building materials needed in carrying out the plans of the corporation are to be secured in the United States according to present plans.

Street Lighting in Nagoya, Japan

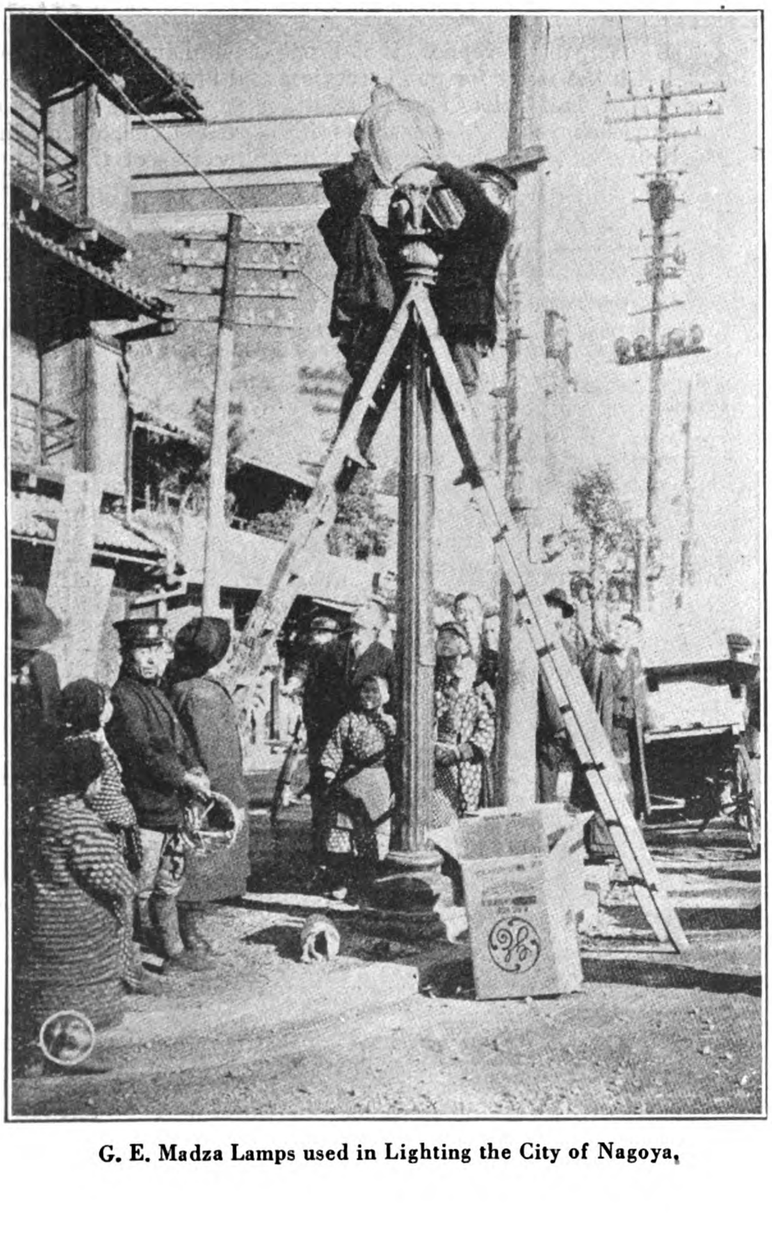
THE city of Nagoya before the recent earthquake had taken a leading position among its sister communities of Japan in the adoption of improved and modern street lighting.



Modern Street Lighting in Nagoya.

There has been in Nagoya a business men's association, the sakaemachi hattenkai, organized some four years ago, and it was due to their initiative that steps were taken to adopt for one of its leading streets a method of illumination that is a credit and an ornament to the city. The well-known series incandescent system of the General Electric Company was chosen and the lamps are Mazdas, made in Japan by the Tokyô Electric Company. The lamp standards, each with a single unit at its top enclosed in a globe of softly luminous glass, present a very fine appearance which is enhanced by the absence of overhead wires, as the lamps are fed from a circuit underground. The installation of this service was made the occasion of a celebration, participated in by the sakaemachi hattenkai, the chamber of commerce and city officials.

Another business men's association, the shinyan agimachi, took up the movement better lighting and were responsible for an extension of the system on the same street—the broadway of Nagoya. The completed installation produced a continuous "White Way" extending to a distance of three kilometres—nearly two miles. As so generally happens incidental to the introduction of a better lighting system, other improvements followed. The street was widened and paved with asphalt, and the locality became a centreof attraction, to the obvious advantage of shopkeepers and business enterprises in general.



G. E. Madza Lamps used in Lighting the City of Nagoya,

Carpet Industry in China

Rapid expansion of the Chinese carpet weaving industry, centered about Tientsin, in the northern part of China is attracting the attention of exporters, and the Chinese maritime customs report for that city, states that in 1922, 3,321,541 square feet of carpet, valued at 2,893,568 haikwan taels, or about $2,160,000 was exported.

In 1921 there were 2,122,520 square feet shipped from Tientsin. The United States ordered most of them, the quality being of special Chinese designs of 90 strings, and fairly long pile.

In North China a number of years ago catholic fathers having a large orphanage near Peking constructed looms and in a small way began weaving and experimenting, employing the boys for whom they cared. As the orphans left the school they carried their trade outside.

Nearly all carpets exported are made on home looms. In Peking one may see at the rear of the carpet shops sheds where balls of heavy whool are being made into carpets, some of them in reserved, obscure and pleasing designs. These shops are to be found many in a row on Carpet street.

The place where the weaving is done is frequently similar to a cow shed, with a long weaving frame of heavy timber against either side. At each frame work six or eight or ten boys and men. The design they are following has been traced for them on the upright strings through which they weave.

One of the drawbacks to the buying of carpets by foreigners who live in China is the matter of design. The patterns and colors have until recently, when drawn by the Chinese at home been loud. This has been overcome somewhat by exporting firms designing their own styles. This has even been done by individual householders. Rug designs about Shanghai seem all to run to dragons. These are now being eagerly bought by the thousands of fairly well to do Chinese who are copying foreign homes but not foreign decorations.

Shoppers in Peking say they find rugs more after the foreign wish there than elsewhere. Favorite colors are dark blues, grays, browns. Into these small, inoffensive figures are worked in by the use of slightly shorter yarn.

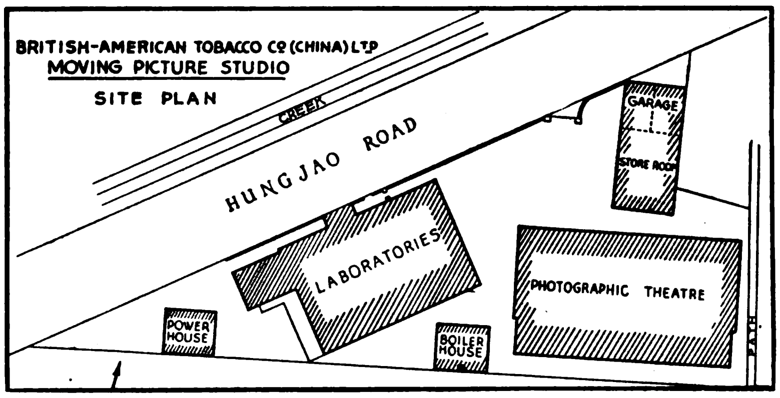
B.-A. T. Movie Plant

By Robert Forsythe

A PLANT for the production and handling of motion pictures is now under construction in Shanghai which will use electricity capable of developing 240 horse-power, or the equivalent of 50,000 candle-power. This plant, the result of the last year's work of the British-American Tobacco Company's moving picture department, is planned to turn out some 200,000 feet of film monthly when completely installed, for use in the educational program of the company. During the recent visit of Sir Hugo Cunliffe-Owen, chairman of the company, plans were perfected by Mr. W. H. Jansen, the organizer of the present motion picture plant, for the new laboratory, studio, and photograph theatre, and these plans received the approval of Sir Hugo, following which work was immediately begun.

The new plant, which will be unique in the Far East, is to be located on Hungjao Road, about 200 yards from Avenue Haig, near the Nanyang College. It will consist of a two-storey laboratory with facilities for toning, coloring, drying, developing, copying, cartooning, title writing, research, cutting, and a mess room; a photographic theatre over one hundred feet long with scene-painting, carpenter, and property rooms; a garage, and a special transformer station to take electric power from the cables of the municipal electricity department without interfering with neighboring circuits.

Although the company has been producing films for over a year the new studio will have the bisset production by electric lighting and not sun-light, and for this purpose an extremely heavy volume of electricity will be used. By special arrangement with the municipal electricity department a transformer station on the premises will step-down the main cable municipal voltage from 5,000 volts to 200 volts and a special central control system will be installed in the new plant similar to that in use in the studios of Hollywood. When in full operation the plant will be taking a thousand amperes of light at 200 volts, a large part of which will be used by four 75-ampere lamps, eight 35-ampere lamps, and one 120-ampere lamp. These will be used in the studio to give full lights, side lights, and powerful overhead light shining down upon the actors. For the latter effect a large Winfield-Kerner dome has been recently received from America which will blaze with four powerful arcs.



Besides branching into the new field of indoor film work, the company will continue to expand its present all China film service, and a special camera man will be permanently stationed in each of the important news centres of China, Hongkong, Shanghai, Hankow, Peking, Tientsin, and Manchuria (the latter covering Harbin, Mukden, and Dairen), and it is expected that by the end of the year a bi-weekly all-China news-reel will be distributed by the company throughout the country. In addition to these six men at fixed points, two men will be kept constantly traveling about China taking scenic pictures.

The centre of this system will be the new laboratory. To this the negatives will be sent in from all parts of China, and from here the finished films will be sent out to all parts of China for release. The laboratory which will be of concrete is planned to handle, with its space and equipment, 200,000 feet of film a month, as this much is considered necessary to satisfactorily cover the China news field.

On the ground floor is the toning and coloring room, where the films will be colored in six different shades, as provisions have been made that all the films turned out by the new plant will be colored. With the present plant, coloring has only been possible with two shades and under difficult conditions, but a much larger range will be made possible in the new plant.

Next to the toning and coloring room will be the developing room. A novel arrangement will allow the films to go rapidly and automatically through the developing room onto the drying drums in the drying room, which will be fifty feet long.

From here the negative film will pass to the printing room where there are four of the most up-to-date printing machines

The mechanical side of moving picture production is fast becoming a highly technical industry, and the delicate and complicated mechanism of the printing machine is particular evidence. When the photographer gets out into the field, the day may be sunny and bright, or dark and rainy. In spite of his technical skill his negatives naturally have not a uniform exposure, and some are faint while others are sharp. On the other hand moving picture audiences demand that the moving pictures shown must be absolutely uniform in their lighting. It becomes necessary, therefore, to make the highly delicate adjustment during the printing. Amateur and professional photographers are able to do this with individual films without difficulty, but when it comes to thousands of feet of film containing scores of thousands of separate pictures, it becomes a difficult thing.

For this process, the new printing machines to be installed by the company at Hungjao Road will use a so-called "master film." This will automatically register the amount of light needed, and is run through the printing machine in parallel with the negative. It controls the light within the machine, automatically increasing it for strong negatives and decreasing it for weak negatives.

Next to the printing room is the cartooning room, where the animated advertising sketches and other additions to the regular film are made. The rest of the floor is taken up with a fire-proof vault where films are stored. All the most modern plumbing accommodations are to be installed for the personnel.

On the second floor of the laboratory is the 40-foot projection room, where films will be tested and screened. A large art department will house the staff of those who do the title writing in English and Chinese, and will do the art work for the decorations, etc.

A special library of Chinese geography, history, and literature, will be kept for reference and use by the scenario department in making Chinese films. On the same floor will be the cutting and joining room, where the unnecessary parts of the films will be shroffed out, and the cut ends joined. Several remarkable machines have been obtained for this purpose, which glue together the severed ends with an overlap of only an 16th of an inch and with a tension equal to the rest of the film. A special elevator will connect this room with the fire-proof vault below. Special mess-quarters will be provided in this building for the staff.

The other large building, the photographic studio, will be 101 feet long by 55 feet wide, and the main studio will be 25 feet high at the eaves and 40 feet at the ridge-pole. In the centre of the studio will be a tank and pool for water scenes, which will be planked over on ordinary occasions. Separate ladies' and men's dressing rooms will be in the same building, together with a scenic department where the backgrounds and stage-scenery will be prepared. A large carpentry shop and a property room will complete the building.

Construction work will be concentrated on the photographic theatre, and this is expected to be in use by the middle of June of this year, while the laboratory will be in use by the middle of September. Quantities of machinery and equipment have already arrived from America, including practically all the lighting equipment.

The moving picture department of the British-American Tobacco Co. has now been in operation a year, was started last year by the single-handed efforts of its present manager, Mr. Jansen, who has enlarged it now until the work requires a staff of almost thirty, which will be increased with the taking over of the new plant. Up to date it has been housed in a private house leased for the purpose, but the work has expanded beyond the space available ; the cutting and joining room has been forced up into the attic, the art department with a staff of six men is cramped into one small room, and the projecting room only allows fifteen feet of throw from the machine to the small canvas. Developing and printing processes have been cramped in small rooms intended for other purposes, and coloring of the films has had to be done in the garage. The new plant will therefore give a welcome chance for working under more favorable conditions.

As an instance, however, of the present available staff, the war memorial unveiling pictures released last week were taken with three cameras ; recent paper hunt pictures were taken with five cameras, and Manager Jansen has been in a position at times to put as many as eleven men on an important assignment.

It is also planned to develop a department of industrial films, showing the processes and development of important industries in China. This will be done in story form similar to the Shanghai police picture " 511 " which gave the steps in a policeman's career and showed the police department in story form.

These films are, and will continue to be, distributed free of charge. Advertising is, of course, the primary object of the company, but the films are also intended to perform a valuable educational rôle, informing the Chinese about their own country, and also about the modern changes which are going on in China. Just as the British-American Tobacco Company is probably the only company in the world engaging on such a large scale in this novel form of advertising, so probably China is the only country being so thorough-covered by non-commercial film service.

For the elimination of any possible race feeling which might creep into the films, every title and sub-head is carefully shroffed twice over, while each film is subject to careful examination lest anything which might cause friction or race antagonism might creep in.

It is estimated that between three and four hundred Chinese see these films for every one foreigner. After they have been released at the Carlton Theatre and other large foreign film-houses in Shanghai, the films go to Wing On's, the Great World, the Old World, and a dozen large Chinese cinema houses in the settlement.

Every one of the five distributing points has a complete circuit. As an example of the size of these circuits, the films which go to Hongkong are exhibited also in Canton, Macao, Sanshui, Swatow, and Amoy, and in intermediate cities.

During the summer months twelve large projectors for open-air theatres will be constantly moving about the country showing the films.

It is estimated that the new film service will be reaching the considerable number of 10,000,000 people by the end of 1924, a monument to the resourcefulness, the organizing ability, and the enterprise of the moving picture department, its staff, and its head. Mr. Jansen's progress was made possible through the untiring efforts and co-operation of the company's progressive board of directors.

Japan, America's Best Customer

Few people fully realize the extent of Japan's economic relations with the United States. Seven per cent. of Japan's total national wealth is annually engaged in foreign trade, whereas only 2 per cent. of our national wealth is so engaged. Theoretically, therefore, Japan is three times as much interested in what goes on outside its own domain in a commercial way as we are. Forty-five per cent. of Japan's exports go to the United States, making us by far Japan's best customer ; China is second, taking 24 per cent. ; India third, with 6 per cent. ; while France and Great Britain take 5 and 3 per cent, respectively.

Five commodities exported by Japan account for 66 per cent. of its total export trade. Of these raw silk ranks first, constituting 41 per cent. of all Japan's exports. Ninety per cent. of this raw silk is sold to the United States. The American market for raw silk, therefore, provides Japan with 36 per cent. of its export trade. There are few instances in which one country purchases so large a share of the principal exported commodity of another. Cotton goods, including yarn and piece goods, make up 18 per cent. of Japan's exports. The market for these goods is found almost entirely in the far east. Silk goods, including habutae, pongee, and Fuji silk, constitute 5 per cent., pottery 1 per cent., and tea 1 per cent. The United States takes a large share of all these—a quarter of the silk goods, a third of the pottery, and 90 per cent. of the tea. In addition to these five major items of export to the United States, whose total in 1922 amounted to $329,000,000, Japan sends us a number of commodities of lesser value, including camphor, straw braid, waste silk, brushes, comestibles, beans, toys, buttons, paper goods, lamps, matches, etc., whose aggregate was $37,000,000, making the total exports to this country $366,000,000. The United States is Japan's principal market for most of these exports, but their total accounted for less than 9 per cent. of our total imports, and most of them are luxuries or semi-luxuries The position of the United States as a market for these products, however, is a most important factor in Japan's economic life.

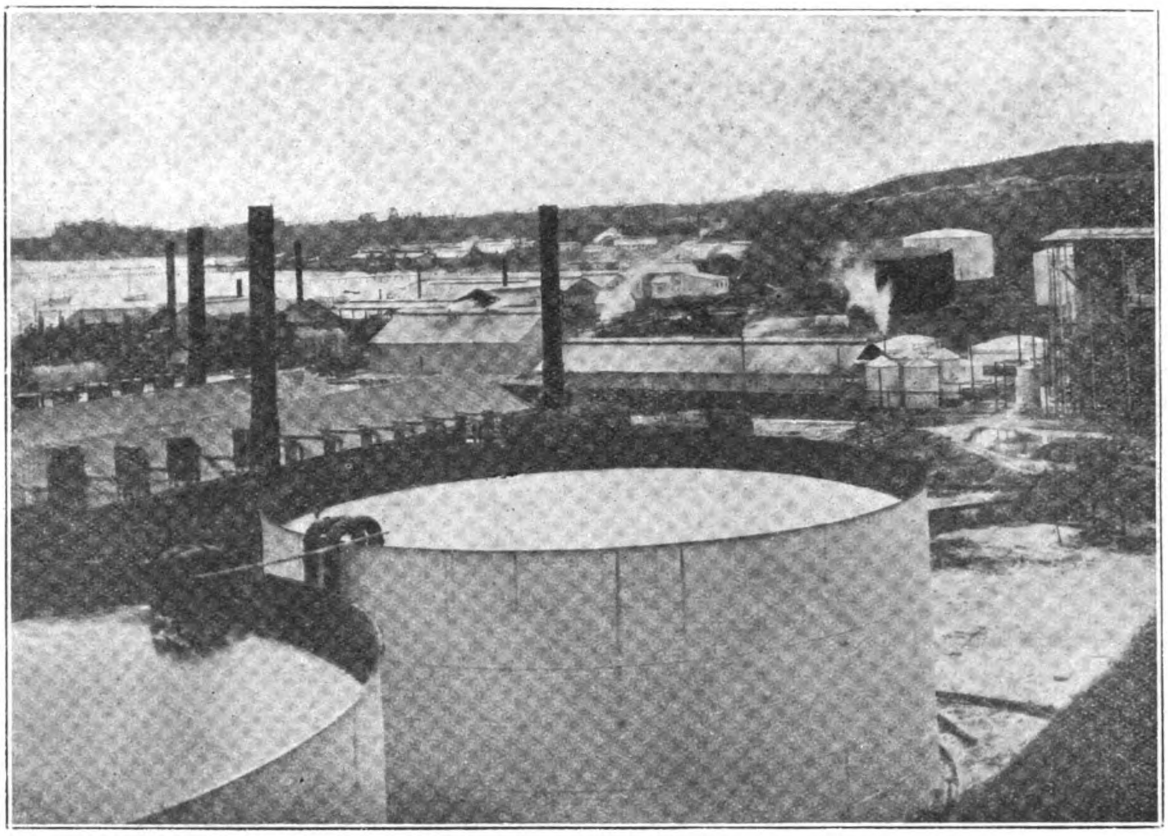
The United States is Japan's principal source of supply, 31 per cent. of Japan's 1922 imports coming from this country. We supplied to Japan more than twice as much in value as any other country, India being second with 14 per cent., Great Britain third with 13 per cent., China fourth with 10 per cent, Kwantung Leased Territory 8 per cent., Germany 6 per cent, Australia 4 per cent., and all others 14 per cent. Our principal export was raw cotton, which, while only one-quarter of Japan's raw cotton imports in quantity, amounted to 40 per cent. of the value. We supplied 41 per cent. of Japan's machinery imports, 70 per cent. of the lumber, 60 per cent. of the iron bars, rods, and plates, 80 per cent. of the kerosene, 93 per cent. of the sulphate of ammonia, and 80 per cent. of the construction material. These purchases from the United States totaled $202,000,000. We supplied an additional $96,000,000 in such items as automobiles, leather, iron tubes, paper and paper pulp, nails, railroad equipment, lead, caustic soda, etc.

Many of these commodities are essential to Japan's industrial life. A few of them could be obtained in quantity only from the United States. Most of them are competitive in the sense that substitutes can be obtained, but such substitutes would not be of the quality desired. Our long-staple cotton, for example, is essential to mix with the short staple from India. Certain types of our machinery are much more suitable for Japan's needs than similar machinery from other countries. Our lumber is comparatively cheap and of satisfactory grade, while our construction material is bought to assure satisfactory building of modern fire-proof structures. Eighty per cent. of Japan's automobile imports are of American make, because our cars are lighter and less expensive to run.

While all these sales of materials, more or less essential to Japan, cause the United States to loom large in Japan's foreign trade, Japan takes but 6 per cent. of our total exports, ranking fifth, after Great Britain, Canada, Germany, and France. While Japan's purchases of our raw cotton, machinery, lumber, iron and steel, kerosene, heavy chemicals, and construction material constitute only a small percentage of our production of these commodities, it is important to note that, as regards our exports of such merchandise, especially lumber and iron and steel, Japan is our best customer.—Frank R. Eldridge.

Iron and Coal in Mongolia

Advices from Harbin indicate that the Russians have paid special attention to the mineral resources of Mongolia since their occupation of Urga and Kiachta. A large number of experts have been sent out all over Mongolia to discover mines, and as a result they have now found three large iron mines, nine coal mines, two copper mines, one crystal mine and one gold mine. The last mentioned mine has attracted their special attention because the ore contains a large proportion of gold and the veins are exceedingly rich, richer than those found in Siberia. The Russians are raising a very large capital and will embark in the enterprise on a large scale.



The Refinery at Balik Papan

Petroleum Production and Trade of the Dutch East Indies

By Albert T. Coumbe, Jr., Petroleum Division, Bureau of Foreign and Domestic Commerce, U.S. Department of Commerce

THE Dutch East Indies, which comprise Sumatra, Java, Borneo, Celebes, Western New Guinea, Timor, and numerous smaller islands, cover an area of about 750,000 square miles and support a population of approximately 50,000,000. Although these people consume annually about 5.5 gallons of petroleum products per capita, which is the highest rate in the Orient, there is not the quantity consumption, and consequently not the present and future field for American exporters, that is to be found in British India and China, where there are populations totaling hundreds of millions. The Royal Dutch Co., incorporated in the Netherlands, is strongly entrenched in these Dutch colonies and it carries on practically all the local production and refining, besides holding the larger share of the market for petroleum products.

The crude production of these Dutch dependencies amounts to more than 16,000,000 barrels annually, or about 2 per cent. of the world's petroleum output. The Dutch East Indies ranked fourth among producing nations for 1921 and fifth in the estimated totals for 1922, having been displaced by Persia.

During 1921 these islands exported about 473,000,000 gallons of petroleum products, exclusive of paraffin, grease, asphalt, and other solid products. The imports for the same period amounted to approximately 33,000,000 gallons, valued at a little more than $12,000,000. The share of the United States in this import trade totaled 51.2 per cent. of the quantity and 55 per cent. of the value.

Production of Crude Petroleum

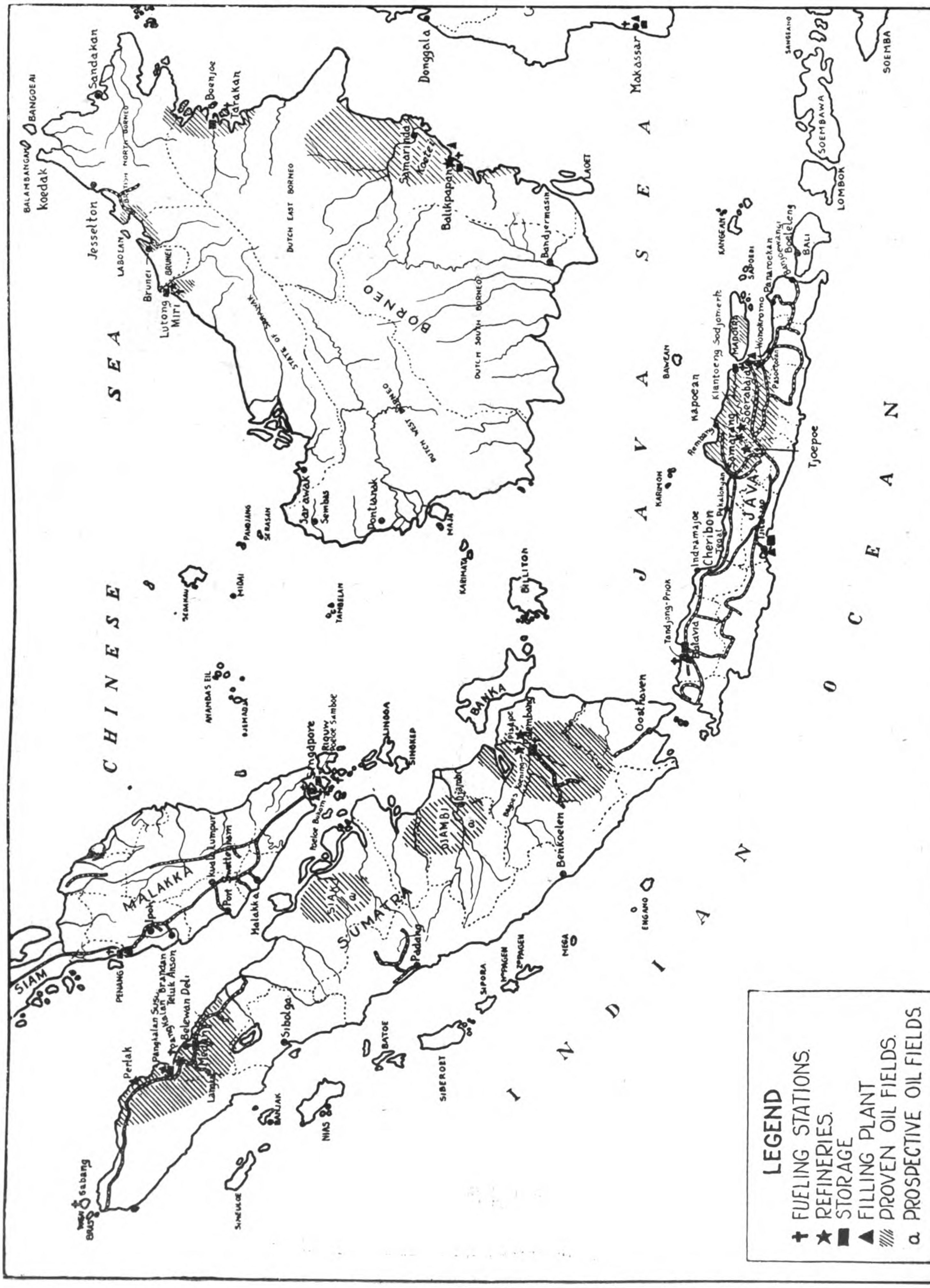
The proven petroleum areas of the Dutch East Indies are in the southern and eastern divisions of Borneo; in the residencies of Semarang, Rembang, and Soerabaya of Java; and in the Palembang, Oostkust, and Atjeh residencies of Sumatra. There is also a small commercial production in Madeora, a small island northeast of Java, as well as in the island of Ceram in the Moluccas.

Following are tables of crude-oil production :—

CRUDE OIL PRODUCTION OF DUTCH EAST INDIES

Districts.	1912	1920	1921
Java :	*Barrels.*	*Barrels.*	*Barrels.*
Rembang	904,217	1,866,181	1,529,204
Semarang	2,389	243,321	37,889
Soerabaya	432,261	426,383	446,227
Madoera	...	180	22
Total	1,338,867	2,536,065	2,013,342
Sumatra :			
South Paiembang ...	2,027,889	1,465,816	1,566,834
North Palembang ...		995,169	946,977
East Coast	1,237,094	404,640	429,901
Ktjeh	1,490,005	994,349	1,341,939
Total	4,754,988	3,859,974	4,285,651
Borneo :			
Koetei	3,243,837	5,353,936	5,334,848
Tarakan	1,594,355	5,116,429	5,002,777
Total	4,838,192	10,470,365	10,337,625
Island of Ceram	—	152,076	354,440
Grand Total ...	10,932,047	17,018,480	16,991,058

Note.—Conversions have been made at the rate of 7.195 barrels to the metric ton. Source : Jaarboek van het Mijnwezer in Nederlandsch Oost-Indie.



Petroleum Map of the Dutch East Indies and British Borneo. Compiled by A. T. Coumbe, Jr., Petroleum Division Department of Commerce

PETROLEUM PRODUCTION BY CONCESSIONS.

[Source: Jaarboek van het Mijnwezen in Nederlandsch Oost-Indie.]

Name and location of concession	Owner	Area Hectares*	Production Metric ton†	Metric ton†	Metric ton†
Java:					
Semarang Residency—					
Klantoeng Sodjomerto	Algemeene Petroleum	196	38	343	360
Bapo	Petreoleum Co. Gaboes	155	295	6,857	33,458
Soerabaya Residency—					
Djabakotta..	Dordtsche Petroleum Co.	15,470	1,566	1,292	1,142
De Twaalf Dessas ..	do.	1,711	18,793	18,925	19,031
Lidah Koelon	do.	887	7,902	7,115	6,966
Metatoe	do.	17,318	1,188	58	355
Made	do.	1,914	29,737	29,589	31,756
Petiken..	Oriental Petroleum Co.	1,219	893	9	11
Rembang Residency—					
Tinawoen	Dordtsche Petroleum Co.	21,454	67,105	96,754	113,407
Panolan	do.	8,499	32,923	55,557	106,130
Djepon	do.	17,994	17,345	26,257	25,899
Toengkoel	do.	704	1	—	—
Banjoebang..	do.	1,803	2,328	9,310	6,797
Plantoengan..	do.	949	321	146	127
Kalipiting	do.	1,076	529	237	211
Tjandi	do.	590	1,033	—	—
Trembes	do.	814	619	—	—
Metes	do.	1,804	1,593	—	—
Wonosari	do.	1,760	1,722	74	—
Gegoenoeng..	do.	1,110	154	1,324	3,169
Petak	Nedlandsche Koloniale Petroleum Co.	1,903	—	3,791	3,069
Temboel	do.	1,930	—	879	562
Madoera:					
Lerpak	Madoera Petroleum Co.	1,989	—	140	25
Sumatra:					
Atjeh Residency—					
Peureula	Perlak Petroleum Co.	4,037	188,993	132,560	129,800
Zuid-Perlak	Petroleum Co. Z. Perlak	3,296	16,749	8,993	8,235
Oost-Peudawa	Royal Dutch	385	1,348	330	165
East Coast Residency—					
Aroebaai	do.	44,679	—	16,626	40,436
Telaga Said..	do.	355	7,026	5,514	5,452
Boekit Mas	do.	37,699	27	—	25
Boekit Sintang	do.	160	430	492	424
Boeloe Telang	Mining, Timber & Agriculture Co. in Langkat	5,393	164,455	11,909	9,902
Palembang Residency—					
Moeara Enim	Royal Dutch	22,144	92,535	88,235	104,376
Bata I	do.	7,124	27,087	70,699	59,475
Bandjarsari..	do.	2,581	9,016	4,723	4,771
Soeban Djergi	do.	4,660	116,125	78,843	66,103
Sumpal..	do.	4,400	11,417	10,161	9,200
Karang Ringin	Petroleum Co., Moesi-Ilir	4,988	6,202	4,208	3,975
Ladang Part	Ned. Ind. Exp. Co.	395	2,027	3,603	2,978
Lematang	Exploration Co., Netherlands	1,838	9,080	6,979	6,479
Arahan..	do.	1,907	2,269	5,331	5,593
Ramok..	Bataafsche Pet. Co.	501	6,004	10,236	14,120
Soengei Langoe	do.	1,091	—	—	17
West Senabing	do.	2,825	—	1,665	1,404
Kloeang	do.	2,349	—	379	764
Soeban Boeroeng‡ ..	do.	8,800	—	52,996	53,327
Tandjoeng Loentar ..	do.	1,151	85	991	864
Kali Berau	do.	3,203	—	1,758	—
Kenawang	do.	3,942	—	2,488	3,829
Grissik	do.	2,254	—	1,275	966
Berau	do.	2,804	—	1	1,665
West Kali Berau	do.	1,900	—	109	702
Djernch	Dordtsche Pet. Co.	2,188	—	1	—
Kajoe Aro	Ned. Kol. Pet. Co.	3,857	—	3	—
Mambang	do.	702	—	63	—
Talang Akar	do.	2,461	—	552	1,433
Borneo: South and east division—					
Koetei I	do.	3,975	—	65	—
Sadjau	do.	3,665	—	99	99
Moeara..	Royal Dutch	18,050	26,715	68,981	102,992
Louise	N. I. Ind. & Trading Co.	20,509	370,278	488,359	454,387
Nonny	do.	135,250	53,852	212,359	186,740
Tarakan I	Royal Dutch	4,951	2,613	325,830	406,995
Tarakan II	do.	4,930	218,979	273,648	303,418
Tarakan III..	do.	3,938	—	2,101	296
Tarakan IV	do.	3,927	—	699	301
Cream: Boela I and II ..	Boela Pet Co.	7,697	—	7,311	21,136
	Total	496,220	1,519,397	2,159,868	2,365,319

*1 hectare equals 2.47 acres.

†1 metric ton of the Dutch East Indies crude equals 7,195 barrels (42 gallons.)

‡Formerly the concessions Bentiala, Boeroeng, and Soeban.

Source: Jaarboek van het Mijnwezen in Nederlandsch Oost-Indie.

*Abstracts of the mining law of the Dutch East Indies, as quoted here, were taken from Senate Doucment No. 11, Sixty-seventh Congress, first session, and also from the corrected copy of the Report of the Federal Trade Commission on Foreign Ownership in the Petroleum Industry, dated Feb. 12, 1923.

Dutch Borneo

Dutch Borneo has two main fields, Tarakan and Koetei. The production from Tarakan comes from a small island by the same name which is just off the northeast coast of Borneo. This island was first explored in 1863 by J. H. Menton, a Dutch mining engineer, and oile seepages were reported. The first concession, however—a property of the Koninklyke Nederlandsche Maatschappij (Royal Dutch Co.)—was not taken up until 1905, and one year later the first commercial production of 57,928 barrels was realized. At the present time there are five concessions on record, all being held by the Tarakan Petroleum Maatschappij, but worked under contract by the Bataafsche Petroleum Maatschappij. The petroleum produced, as shown in the above table, was 5,116,429 barrels in 1920 and 5,002,777 barrels in 1921, the latest year for which detailed statistics are available. These totals approximate one-third of the total yield of the Dutch Indies. Tarakan oil has an asphaltic base and a specific gravity of 0.95 to 0.98, contains practically no gasoline, and therefore is generally used as fuel oil after treatment for the removal of sand and water.

The Koetei field in the south and east divisions of Borneo extends along the coast from Balikpapan to Samarinda, although the territory still farther north shows indications for future development. The first concessions were taken up in 1891 by the Netherlands Indies Industry & Trading Co., but the first well was not reported until 1897, when one was sunk at Sanga Sanga. At the present time this field has the largest yield of any in the Indies, with an output of slightly less than 15,000 barrels daily. The horizons or sands give different crudes, from light paraffin to heavy several asphaltic, ranging from 0.84 to 0.96 specific gravity.

Java

There are petroleum seepages in many parts of Java, but the commercial production comes from the shallow sands in the northeastern portion in the residencies of Soerabaya, Rembang, and Semarang. The first concession was taken up in the Soerabaya residency in 1889 by the Dordtsche Petroleum Co., which still operates most of these fields, although the Nederlandsche Koloniale Petroleum Maatschappij, a subsidiary of the Standard Oil Co. of New Jersey, holds several concessions which yield a few thousand barrels annually. The richer deposits are in the Rembang residency, where something over 1,500,000 barrels was the output for 1921. The total Java production for 1921 was 2,013,342 barrels, including a small quantity from the adjacent island of Madoera. The crude from these fields has an asphaltic base, although paraffin is also present. It ranges from 0.825 to 0.916 in specific gravity.

Sumatra

The productive fields of Sumatra are in the Perlak district of the Atjeh residency, in the Langkat district of the Oostkust residency and in the Palembang residency. In 1883 the first concession, known as "Telaga Said," was taken up in the Langkat district. Commercial production dates from 1890, when the above property was bought by the Royal Dutch Co. The Perlak Petroleum Co., in conjunction with the Royal Dutch, started work in the Atjeh residency in 1899 and was granted the Peureula concession. There are seven different holdings there now, all of them directly or indirectly controlled by the Royal Dutch. The 1921 production of the field amounted to 1,341,939 barrels. Late reports mention the entrance of salt water into the petroleum sands.

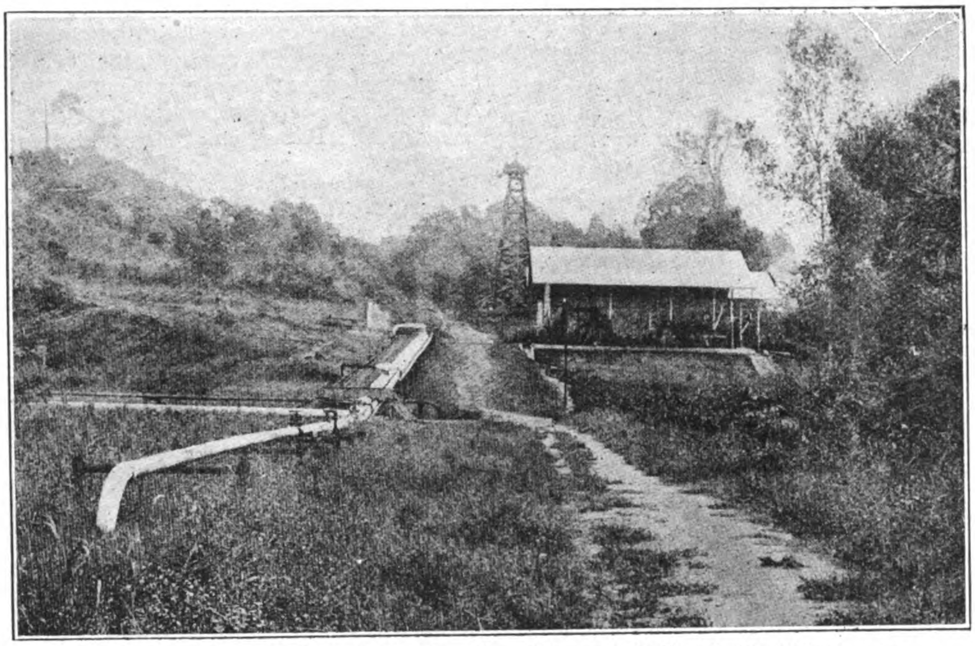
The Moeara Enim Co. and the Sumatra-Palembang Co., both organized in 1897, were the pioneers in the southern Sumatra field of the Palembang residency. The first-mentioned company carried on the bulk of the development in the district until 1904, when the various holdings were bought in by the Royal Dutch. At present this organization controls the entire southern Sumatra district except for a few concessions held by the Nederlandsche Koloniale Petroleum Maatschappij, the subsidiary of the Standard Oil Co. of New Jersey. The 1921 yield totaled 2,513,811 barrels for the residency, or 946,977 and 1,566,834 barrels, respectively, for the north and south fields of the area.

The crudes from the several Sumatran fields vary considerably, but, generally speaking, they are low in paraffin content and yield a high percentage of benzine distillates.

Ceram

There is a new small oil field in the northeastern portion of Ceram, one of the Molucca Islands in the Amboina residency. Actual operations are carried on by the Bataafsche Petroleum Co., a subsidiary of the Royal Dutch, although the titles of the several concessions are in the name of a holding company, the Boela Petroleum Maatschappij. Commercial production started in 1914 with a yield of 3,497 barrels, increasing to 354,400 barrels for 1921 (the

latest returns available). The Ceram crude yields a high-grade fuel oil, all of which is disposed of at Baela Bay, a fueling station located on this island.



Pumping Station of the Bataafsche Petroleum Company in Perlak (Atjeh), Sumatra

Possible Fields and Estimated Reserve

There are several known but yet undeveloped oil-bearing areas in the Dutch East Indies. The larger of these is the Djambi field, located in the residency of the same name, in central Sumatra. There are a large number of "anticlines" already mapped in this district, and it is considered to be the most promising of future fields. An American and several Dutch companies negotiated with the colonial government over a period of several years concerning the granting of concessions in the Djambi area, but the question was not settled until late in 1921, when the final award was made to the Bataafsche Petroleum Maatschappij. The grant, amounting to 4,312,620 acres, is in the name of the Nederlandsch Indische Aardolie Maatschappij (Netherlands Indies Mineral Oil Co.), which has a capital of 10,000,000 guilders. This company has 10,000 shares, of which half are owned by the Dutch colonial government and the remainder are the property of the Bataafsche Petroleum Maatschappij, the operating company of the Royal Dutch. Uncertainty as to future taxation methods has retarded actual developments, but drilling on an extensive scale is expected soon.

Farther to the northeast is still another prospective petroleum area known as the Siak field. It lies along a river of the same name in the south-eastern portion of the Oostkust residency of Sumatra. Very little of the geology of the section is known as yet, so its value as a future field is more or less speculative.

The colonial government, working through its "mining service," has been carrying on survey and exploration work in the Atjeh residency to the west and north of the present Perlak area, but conditions were found to be unfavorable. Other investigations of this nature were made to the south and east of the Atjeh field, with results that indicate the extension of the petroleum-bearing formation in that direction.

During 1922 a new field was discovered on Boenjoe, a small island near Tarakan and off the northeast coast of Borneo. The petroleum sands are believed to be a continuation of the extensive Tarakan field.

The geological formation of the Borneo coast opposite Tarakan, as well as the territory north of Samarinda, is believed to be favorable for the retention of petroleum in commercial quantities, but up to the present nothing has been done here beyond preliminary surveys.

Likely geological structures and even actual oil seepages are also known to exist in various parts of Java outside of the present producing areas, as well as in the other islands of the colony, such as Celebes, Boeroe, Timor, Sumbawa, and Western New Guinea. Most of these possible fields, especially those outside of Java, will probably not be developed for a number of years because of the remoteness of these places from centres of civilization, a tropical climate that is generally unhealthful for the white races, and the unwillingness on the part of the natives to hire out as laborers. This labor question does not exist in Java, as here there is a 35,000,000 population to draw upon and, furthermore, the Javanese will work. In the other islands of the archipelago the natives are not so numerous; besides, in Sumatra they are too well off or too proud to do coolie work, while in Borneo, Celebes, and New Guinea the scattered tribes are still very primitive and, generally speaking, avoid the white man and his ways. This difficulty of finding local labor in these outlying islands—which makes it necessary to import contract coolies from Java, China, or British India—is and will continue to be an important factor tending to delay for a number of years the development of many of the Dutch East Indian prospective fields.

Because of climatic conditions that are rather severe on the white race, and the thick, almost impenetrable tropical jungle that blankets most of the islands, the nature of the underlying strata is practically unknown, except in the present commercial fields and their immediate vicinity. This lack of geological knowledge based on comprehensive surveys makes a calculation of the possible petroleum reserve of these colonies a most difficult problem. Dr. David White of the United States geological survey believes that a total of 3.2 to 4 billions of barrels is a conservative estimate for the amount of petroleum still in the ground in the Dutch East Indies and Papua.

Pipeline of the B. P. Co. in Perlak (Atjeh), Sumatra

Producing Companies

There are two producing interests in the Dutch East Indies—the Koninklyke Nederlandsche Maatschappij tot Exploitatie van Petroleumbronnen in Nederlandsch-India (Royal Dutch Co.), including its various subsidiary companies, and the Nederlandsche Koloniale Petroleum Maatschappij, a subsidiary company of the Standard Oil Co. of New Jersey.

The Royal Dutch Co. was incorporated in the Netherlands in June, 1890, and in January, 1907, it united with the Shell Transport & Trading Co. (Ltd.), incorporated in England in October, 1897—forming what is known as the Royal Dutch-Shell group, a combination that controlled 11 per cent. of the world's petroleum production in 1921. At the time the above union took place two new companies were formed for the purpose of carrying on the business of the organization. They were the Anglo-Saxon Petroleum Co. (Ltd.), registered

in England with £25,000,000 capital (which company takes care of the larger part of the shipping of oil to places outside of the Dutch East Indies), and the Bataafsche Petroleum Maatschappij, registered in the Netherlands with a capital of 300,000,000 guilders. The latter company carries on all production and refining in the colonies except in the island of Java. Sixty per cent. of the capital of both these companies is held by the Royal Dutch Co. and the remaining 40 per cent. is the share of the Shelf Co.

The Royal Dutch Co., working through the Bataafsche Petroleum Co., has practically complete control of the petroleum output in the Dutch colonies, producing 93.6 and 97.2 per cent. of the total, respectively, for the years 1920 and 1921, according to the report of the federal trade commission of foreign ownership in the petroleum industry, issued in February, 1923. The Bataafsche company not only operates fields in Borneo and Sumatra, but also works through several affiliated companies. The larger and more important of these is the Dordtsche Petroleum Maatschappij (capital 2,000,000 guilders), the control of which was secured in 1911. This subsidiary company carries on the Java production and acts as the selling agent throughout the Dutch East Indies. Another affiliation is the Nederlandsch Indische Tankboot Maatschappij, which company is the interisland distributer of crude and refined products throughout the colony. The companies, operating or owning concessions in Sumatra, directly or indirectly connected with the Royal Dutch and Bataafsche companies are the Moera Enim Petroleum Maatschappij, Periak Petroleum Maatschappij, Petroleum Maatschappij Zuid-Perlak, Petroleum Maatschappij Moesi-Ilir, Nederlandsch Indische Exploratie Maatschappij, Exploratie Maatschappij, Nederland, Maatschappij tot Mijn-, Bosch en Landbouw Exploitatie in Langkat, and the Nederlandsch Indische Aardolie Maatschappij.

The Bataafsche carries on all the actual work in Borneo, although the important concessions of the Koetei and Tarakan fields are in the name of the Royal Dutch Co., the Nederlandsch Indische Exploratie Maatschappij, or the Tarakan Petroleum Maatschappij. Conditions are similar in the island of Ceram, where the Boela Petroleum Maatschappij holds title to the concessions, although they are worked by the Bataafsche Co.

The principal American interest in the Dutch East Indies is the Nederlandsche Koloniale Petroleum Maatschappij, a subsidiary of the Standard Oil Co. of New Jersey, organized in the Netherlands in 1912. This company, generally referred to as the Koloniale, has several properties, the best known of which is the Talang Akar concession in the Palembang residency of Sumatra, which produced about 11,000 barrels in 1920 and approximately 10,500 barrels for the first nine months of 1921, the latest period for which actual returns are available.

Other producing leases of this company are the Petak and Tremboel holdings in the Rembang Residency of Java.

The Koloniale's total production is officially given as 30,694 barrels in 1918, 39,227 barrels in 1919, and 37,076 barrels in 1920.

Prospecting and Concession Regulations

The mining laws of the Dutch East Indies covering prospecting and the production of petroleum date back to an act of May 23, 1899, Official Gazette No. 124. This was amended by an act of September 26, 1910, Official Gazette No. 293, and still further amended by an act of July 20, 1918, Official Gazette No. 588.

The Dutch law is very specific in regard to those who are eligible to obtain prospecting licenses and title to concessions. Only Dutch nationals or inhabitants of the Netherlands or the Netherlands East Indies are able to secure such privileges.

The law applies to companies as well, and only firms domiciled in the Netherlands or the Netherlands East Indies, the majority control of which is in the hands of Dutch nationals or inhabitants of the Netherlands East Indies (the latter residing either in the Netherlands East Indies or in the Netherlands), are allowed prospecting or concession rights. Article 4 of the mining law reads as follows :

(1) Only the following can hold prospecting licenses or mining concessions: (a) Netherlands nationals ; (b) inhabitants of the Netherlands or of the Netherlands East Indies ; (c) companies domiciled in the Netherlands or in the Netherlands East Indies, or which, in the case of limited companies, the single manager or director, or both, or if there are several managers or directors, the majority of such managers or directors, and in the case of private companies financed by a sleeping partner, the single active partner, or if there are two such, both, or if there are several such, the majority of them, are Netherlands nationals or inhabitants of the Netherlands East Indies (in the latter case residing in the Netherlands East Indies or in the Netherlands), with the proviso : That the persons or companies not domiciled in the Netherlands East Indies must be properly represented there ; and that persons domiciled in the Netherlands East Indies, the representatives in the Netherlands East Indies of persons not domiciled there, and the resident managers or representatives in the Netherlands East Indies of companies domiciled there or in the Netherlands must have authority to stay in the district or districts in which the prospecting or mining is to take place.

(2) Applicants for a prospecting license or a concession must take up their domicile for the duration of the prospecting license or concession or for all purposes connected therewith in the office of the administrative head of the district within which the territory covered by their prospecting license or concession is situated either wholly or partly.

(3) At the death of the lawful holder of a prospecting license or mining concession the rights and obligations resulting therefrom shall pass to his assigns, provided that they comply with the requirements of the present article either immediately or within one year of the date upon which they legally enter into such rights and obligations. During that year the said rights and obligations may be transferred to other persons or companies provided that such persons or companies comply with the requirements of the present article with regard to prospecting licenses, due regard being had to the stipulation under Clause 7 of Article 7, and always subject to the sanction of the governor-general.

Previous to the amendment of July 20, 1918, Official Gazette No. 588, the discovery of a mineral entitled the finder to concession rights, provided that the prospecting had been done under license and in accordance with the various provisions of the mining law. The 1918 amendment divided the various minerals into two classes, designated as A. and B. No change was made in the law pertaining to Class A minerals, and the discovery of any of these entitled the finder to a concession provided other parts of the law were satisfied. Petroleum, as well as coal, asphalt, bitumens, mineral wax, and iodine, was placed in Class B. The mining law, as amended, specifically states that the discovery of a Class B mineral does not entitle the finder to a mining concession. Mineral deposits thus found are to be worked by the government or by companies working under contract to the government.

The Dutch mining law covering the above-mentioned points is as follows :

ARTICLE 1. (1) In the Netherlands East Indies rights in land do not include the right of disposal over the following minerals, etc. :

(a) Precious stones, graphite, platinum, osmium, iridium, gold, silver, mercury, bismuth, molybdena, tin, wolfram, lead, copper, zinc, cadmium, nickel, cobalt, chromium, iron, manganese, antimony, arsenic, and strontium, whether pure or in the form of ores, and also other minerals, etc., found in the same deposits as the above named and thus extracted together with them ; minerals, etc., which may be of use owing to their percentage of sulphur or for the preparation of alum and vitrol ; phosphates which serve as fertilizers, and saltpeter ; rock salt and the salts occurring with it in the same deposits.

(b) Anthractite and all kinds of hard and soft coal ; petroleum, bitumen, mineral wax, and all other kinds of bituminous substances, either solid or liquid, and inflammable gases—the latter in so far as they are not of recent date (marsh gases) ; iodine and its combinations.

(2) In case of doubt as to whether any particular mineral, etc., is one of those mentioned in the foregoing list, and in particular one of those coming under (a) or (b), the decision shall rest with the governor-general.

(3) The right of prospecting for and extracting such minerals, etc., will be granted pursuant to the provisions of this law. * * *

ARTICLE 28. * * * (2) (a) The discovery of one of the minerals, etc., specified sub (b) in Clause 1 of Article 1 shall not entitle the discoverer to a mining concession. Only the government, or persons or companies with whom contracts are entered into by the government in pursuance of the stipulations of Article 5a, shall have the right to mine such minerals, etc. In the absence of a special agreement the reward for such a discovery shall be determined in each case by the governor-general.

In accordance with Official Gazette No. 15, of February 22, 1921, the islands of Sumatra and Borneo were closed to private prospecting, this decree setting forth that these islands would be reserved for government exploitation. This same decree mentioned that after July 1, 1921, Dutch New Guinea would be open to application for prospecting licenses.

The colonial government carries on exploitation and development work through its own mining service or "Dienst van de Mynbouw," which consists of two bureaus or divisions, namely, (1) of exploitation, and (2) of concessions and licenses. During the last few years this service has made a number of surveys along the northeast coast of Sumatra from the Atjeh field to those in Palembang residency. As a result of this pioneering the Atjeh field has been rather definitely limited toward the northwest, but extended to the south and east, and the Djambi area has been shown to be the most important prospective field in the Indies. The petroleum

formations along the eastern coast of Borneo, as well as on the small islands of Tarakan and Boenjoe, have been the subject of special study, and all the strip of coast from British North Borneo southward to Balikpapan is now known to be quite favorable for the natural storage of petroleum. At least one well-equipped expedition of the mining service was sent into the country known as the Bird's Head at the western extremity of New Guinea, but the meager reports available on this prospecting do not indicate that this region contains large commercial pools of petroleum.

After the mining service has located prospective petroleum fields in a closed territory, the government may undertake the actual development or it may contract with and grant a concession to the highest bidder for this work. Such concessions are generally made for a period up to 75 years. The mining law covering the disposal of these grants is as follows :

ARTICLE 5a. (1) The government shall have power to cause prospecting and mining to be carried on in places where such do not conflict with rights granted to prospectors or concessionaires.

(2) For this purpose the government shall have power either to undertake prospecting and mining work itself or to enter into agreements with persons or companies binding them to undertake the work of prospecting and/or mining : *Provided*, That such persons satisfy the requirements laid down under Clause 1 of Article 4 of this law.

(3) With the exception of agreements referring exclusively to the undertaking of prospecting work, such agreements shall not be concluded until authority to do so has been granted by law in each individual case.

(4) The enactment by which pieces of land or districts are reserved for prospecting or mining on the footing laid down in this article shall name the minerals, etc., which are to be the object of such prospecting or mining. * * *

ARTICLE 31. If, as the result of a research ordered by the government, a mineral deposit is discovered which is, in the judgment of the governor-general, suitable for exploitation, the governor-general shall, subject to the rights of third parties, fix the limits within which no concession for the extraction of such mineral or minerals, etc., shall be granted except upon public tender, without prejudice to the right of the government itself to undertake mining work within the said limits or, pursuant to the provisions of Article 5a, to enter into agreements with persons or companies whereby the latter bind themselves to undertake the exploitation of the deposits. In special cases the requirement of open competition may be departed from on the strength of powers granted by a royal enactment.

ARTICLE 32. Article 31 shall apply to mineral deposits which, in the judgment of the governor-general, come under consideration for working but for working of which a concession cannot be claimed pursuant to this law, and which do not fall under the provisions of Clause 1 of the said article.

ARTICLE 33. (1) In the case of a concession being put up for public tender it shall be allotted to the party offering the largest amount in cash, provided that, in the judgment of the governor-general, there is no reason why such party should not be granted the concession.

(2) If the putting up of the concession for tender leads to no result, then, provided that there is no reason to the contrary and that no concession has been granted privately, the ground reserved pursuant to the provisions of Articles 31 and 32 shall be again thrown open for prospectors.

In open territory, as in Java, Madoera, and some of the smaller islands, private prospecting is allowed to individuals and companies, provided they meet the nationality requirements mentioned under Part 1 of Article 4. The procedure for obtaining prospecting licenses, their duration, renewal, and the various other regulations covering them, are definitely set down in the following abstracts from the colonial mining law :—

ARTICLE 7. (1) The right to prospect shall be conferred by a written government license, which shall not be granted until after the parties with direct rights in the land affected, or third parties interested in it, have been given an opportunity of defending their interests, and then only on condition that the licensee enters into an obligation to pay compensation in advance for the damage which will be caused by the prospecting work, or, if the amount thereof cannot be determined in advance, to give security for the payment of such compensation.

(2) Licenses of the nature referred to in the preceding clause shall be issued by the official appointed for that purpose by special enactment. The application for permission to prospect, in which the ground to be covered must be indicated as exactly as possible, must be in writing and shall be lodged in duplicate with the said official, who, after having noted upon both copies of the application the date and hour of its having been lodged, shall return one copy to the applicant.

(3) Applications shall be dealt with in order of priority.

(4) Licenses shall be granted for a definite period not exceeding three successive years in duration, and for a field of search extending to an indefinite depth within the vertical projection of a piece of ground indicated as exactly as possible in the license. A license may be prolonged twice, each time for not more than one year, if the holder of the license lodges an application to that effect before the expiration of the original term of the license and in the manner laid down in clause 2 of this article. Conditions may be attached to a license.

(5) There shall be a right of appeal to the governor-general against decisions given on applications for licenses or for prolongation thereof. The governor general shall have power to deviate for reasons of equity, or in the interest of the public, from the rule laid down in Clause 3 of this article.

(6) The prospecting work must be commenced within one year from the date upon which the license for same has been granted.

(7) For the transference of a license the sanction of the government must be obtained.

(8) Further regulations for the carrying into effect of this article, and also with regard to the maximum dimensions of pieces of land for which prospecting licenses may be applied for, will be laid down in a special enactment.

ARTICLE 8. (1) Prospecting shall not be permitted (*a*) in pieces of land or districts which have been reserved either for prospecting and mining work of the nature referred to in Article 5a or for the granting of a concession after public competition pursuant to Articles 31 and 32 ; and also in pieces of land for which concessions have been granted to other parties or with regard to which agreements of the nature referred to in Article 5a have been entered into with other parties, in so far as such prospecting has for its object the minerals, etc., to which the reservation, the concession, or the agreement refers ; (*b*) in pieces of land for prospecting within which a license has been granted to other parties, as long as the latter still have the right to claim a concession on the strength of that license ; (*c*) in pieces of land or district which have been closed to prospectors by the governor general in the public interest.

(2) Prospecting work shall not extend, within the field of search, to ground upon which fortifications or government or public buildings stand or in which churchyards, graves, public roads, canals, or railways are laid down nor to ground which the native customs cause to be regarded as consecrated ground or in which prospecting is forbidden in the public interest (as to which the governor-general shall judge) nor to within a certain distance, to be determined by special enactment, of the aforesaid ground or pieces of ground.

(3) Prospecting work shall also not extend to pieces of ground upon which dwelling houses or factories are situated nor to the ground surrounding such dwelling houses or factories at a distance from them to be determined by special enactment, unless the consent of the parties with direct rights in such ground or of third parties interested in it be first obtained.*

(To be continued.)

*Abstracts of the mining law of the Dutch East Indies, as quoted here, were taken from Senate Document No. 11, Sixty-seventh Congress, first session, and also from the corrected copy of the Report of the Federal Trade Commission on Foreign Ownership in the Petroleum Industry, dated Feb. 12, 1923.

Berloy Metal Lumber

The field of metal lumber is floor, partition and roof construction. It does not take the place of structural steel or reinforced concrete beams and columns. In smaller buildings, however, it can be used for the complete structure.

Metal lumber offers a construction which is notonly fire-proof but also sound proof and insect proof. Its low dead load means easy transportation of a comparatively small quantity of materials of great efficiency. Erection can be carried on very rapidly without special equipment fcr specially trained workmen as the work is simply the well-known joist and stud construction combined with a fire-proof and wonderfully efficient material.

Metal lumber is splendidly adapted to use in countries subject to earthquake. With great strength and stiffness it combines a degree of elasticity not surpassed by any other construction and because of its adaptability, it can be used to brace and tie together the structure in which it is used, affording a big added factor of earthquake-resistance. Here again the moderate dead load is an advantage since it lessens the strain on supporting structure and the fire-proof qualities are a safe-guard against the sweeping fires which so often follow earthquakes.

Metal lumber is not a new or untried material. It has been used successfully in thousands of buildings in all parts of the United States over a period of many years. It has been used in buildings as high as fourteen stories and in many homes and other smaller structures.

The United States government used metal lumber in the 44 buildings which constitute the Schofield barracks at Honolulu, H. I. The Bethlehem Steel Co. used metal lumber for a complete mining village of 332 buildings in Chile, S. A. Metal lumber was used in the government observatory at Lima, Peru, and it has also been used extensively in many other buildings in Central and South America.

* * *

Of the two 12,000 k.w. generators of the Momoyama Power Plant of the Daido Electric Power Company (Daido Denryoku K. K.), one has been completed, and passed the inspection of the communications department on November 22, 1923. The transmission of the power to Osaka was commenced on November 24.

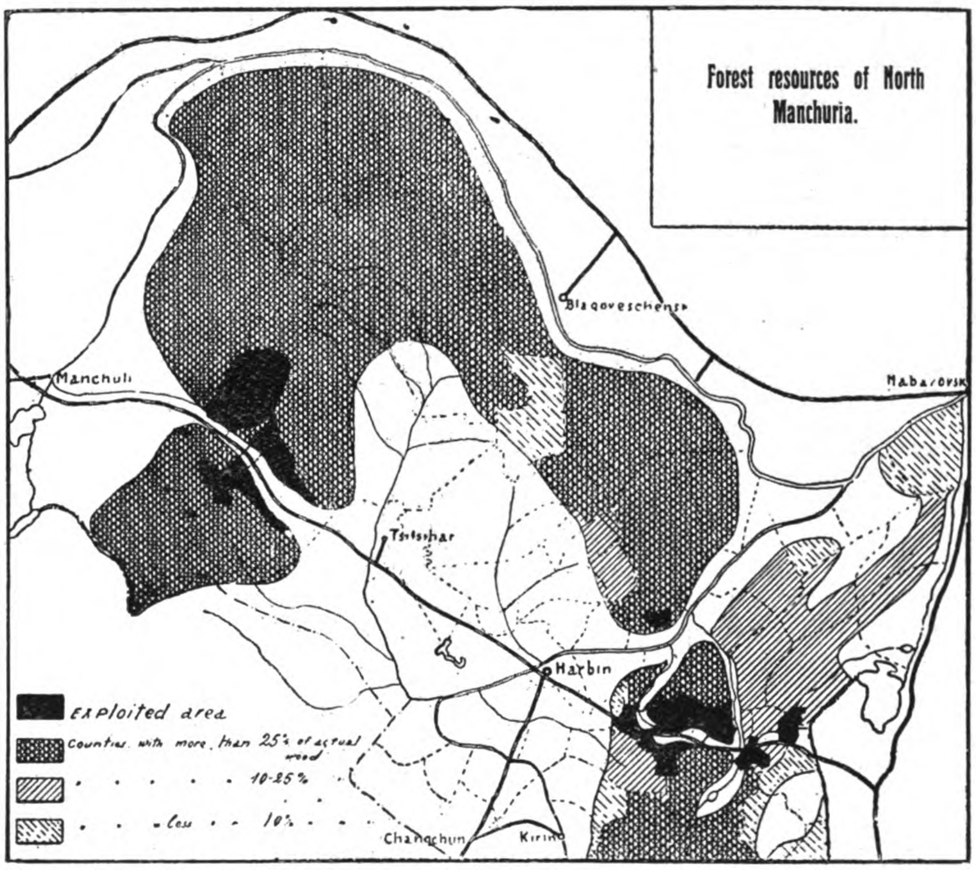
The Chinese Eastern Railway and Its Zone

Forestry and Mining

ACCORDING to official sources the reserve stock of timber in North Manchuria is estimated at 136 billions of cubic feet. Out of this quantity only one thirty-fourth part (four billions) is actually exploited.

In former days the whole territory of North Manchuria was comparable to "a Sea of trees." Proof hereof is contained in the name given to the country in the Tunghus dialect, wherein it is named "Votsi" the meaning of which is "Forests."

After the construction of the Chinese Eastern Railway and the enforced colonization of the country, forests were gradually logged, but only in districts in the vicinity of the railroad.



Actually the forests of North Manchuria assume the form of an enormous arch, extending from the confluent of the Shiks and Argun rivers to the southeast—towards the Sungari river, crossing the same in the area of the city of Sansing; and, maintaining their original direction in Kirin province, they merge with the woodlands of South Manchuria and Korea near the sources of the Sungari and Yalu rivers. The southwestern end of the arch is continued by a broad strip of forests, stretching through Barga southwards to the chain of the Great Khingan range.

The forests of both Heilungchiang and Kirin provinces possess enormous reserves of timber for building and for fuel purposes, which are estimated at 136 billion cubic feet. The most important forest districts, where logging is actually carried on, are the following—the eastern line of the Chinese Eastern Railway, the western, or Khingan zone, and the lower Sungari zone, lying at a distance of from 200 tp 300 kilometres from Harbin, down the course of the Sungari river.

The eastern forest zone is of the greatest importance in the local timber industry. It stretches along the railway line from Harbin to Pogranichnaia (Suifenho) between the stations of Hsiaolin and Silinkhe. The intense work of this eastern zone is caused by the richness of its most valuable tree species, which are the cedar, Ayan pine, nut-tree, velvet tree, lime tree, maple and others, and also by the nearness of the zone to the most important timber markets of Harbin and Changchun. The western (Khingan) zone is at a very great distance from these markets and abounds only in larch trees, yielding excellent material for special requirements, and in birches, which are used for fuel.

In the eastern zone there are situated the largest forest concessions of the Chinese Eastern Railway Company, and of the following timber merchants: Skidelsky, Kovalsky, Popoff, Shevchenko, Slinkin, and others. The concessions are equipped with railway feeder lines, they are well organized, and a few of them possess sawmills.

The most important concessions in the Khingan forest zone, stretching over a length of 300 kilometres from Niantsienshan station to Yakeshi station, are owned by Vorontsoff Bros. (Yakeshi), Shevchenko Bros. (Horgo and Irekte), Liu-ta-tsai (Puhetu) and Ma. This area produces fire-wood, larch wood sleepers, telegraph poles and supporting stanchions for mines.

From the lower Sungari zone less than 55,000 tons of products of the timber industry are brought to the railway, though as a whole the named zone supplies to woodless districts about 600,000 tons of timber, which is rafted on the Sungari river.

About 85 per cent. of fire-wood and timber building materials prepared at the concessions, were used in 1921 by the Chinese Eastern Railway for its own needs and only 15 per cent. were carried under commercial tariff rates for requirements of the local market and for export abroad.

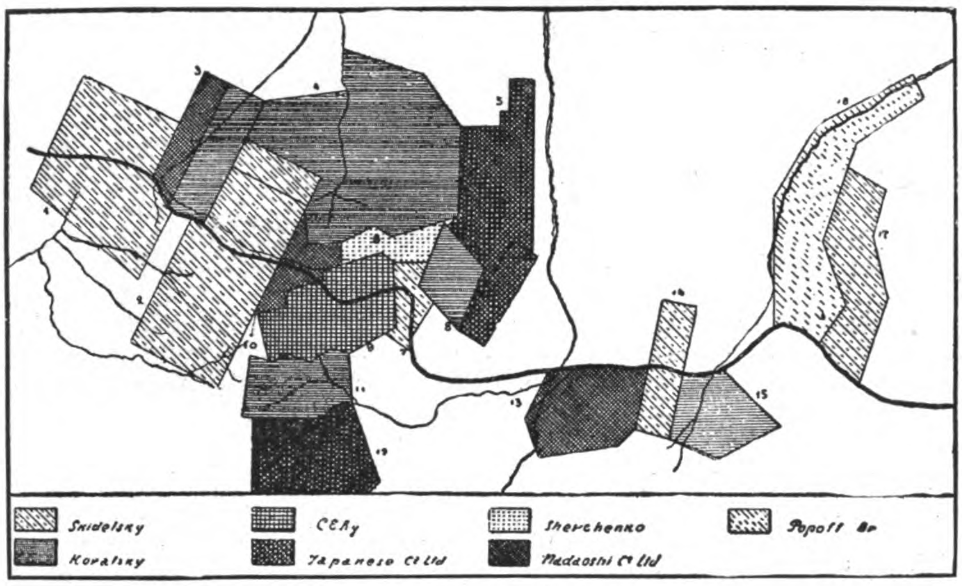
In 1922 already 37 per cent. were put upon the private market. Exports moved almost exclusively in the southern direction and amounted to 114,000 tons in 1922.

Manchurian timber has excellent opportunities for conquering foreign markets to a larger extent; however, in order to arrive at such result, it would be necessary to introduce a number of measures for improving timber industry in North Manchuria.

North Manchuria is very rich in mineral deposits: gold, various ores, natural soda, etc. However, so far only the output of coal, building stone and lime is of any industrial importance.

The total requirements of North Manchuria in coal during these last years amounted to about 500-600,000 tons, out of which quantity 500,000 tons were carried by the Chinese Eastern Railway. In the nearest future this consumption is liable to increase considerably.

In districts more accessible for logging operations in North Manchuria forests have been depleted and are moving away from the railway line, causing thereby a high price of fire-wood. For this reason the Chinese Eastern Railway has already started to replace wood-fuel by mineral fuel. 50 per cent. of the requirement of coal fuel are covered by local coal, almost exclusively of Chalainor origin, the remaining 50 per cent. are imported from abroad. The output of coal from the Chalainor mines numbers about 300,000 tons per annum on an average.



Map of the Eastern Concessions

Other coal deposits in North Manchuria have a very small output, viz., mines on the Hankhe river near the city of Mergen, and mines near Bukhai station of southern line. All these deposits yield only a low grade coal. The coal deposits at Matsiaokhe (100 kilometres from Matsiaokhe station) possessing an excellent coal, may have a very promising future. However, to work the same, it would be necessary first to obtain the concession required and to lay a feeder line over a stretch of 125 kilometres.

From outside markets 250-300,000 tons of coal are imported into North Manchuria. The bulk of these imports consists of South Manchurian Fuchun coal. The other kinds of coal, such as coal from Suchan, Karanor, Tchernoff and Tcheremkhovo, were imported from Russian territory in comparatively small numbers. Lately these imports have again begun to grow considerably.

Industry

Manufacturing industry in the country has by far not yet reached its due development. It is concentrated at the cities of Harbin and Fuchiatien, where all branches of industry existing in North Manchuria are represented, with the exception of wool-washing plants. The turnover of Harbin by far exceeds the turnover of all points on the railway line, taken together. The yearly turnover of industrial enterprises in North Manchuria of foreign (European) type is estimated at 25 million gold dollars.

Steam flour mills in the railway zone transform 300,000 tons of wheat.

The first place in manufacturing industry is taken by flour-milling. There exist in all 35 flour mills in the concession zone of the Chinese Eastern Railway, which mill up to 300,000 tons of wheat. 24 of these mills are situated in Harbin, and nine are at different points on the railway line. Besides flour, the local mills produce manna and buckwheat grits, they husk buckwheat and millet.

Out of the flour produced, about two-thirds are brought to the Chinese Eastern Railway and the remaining one-third is consumed directly at the points, where the mills are located, or is exported by river.

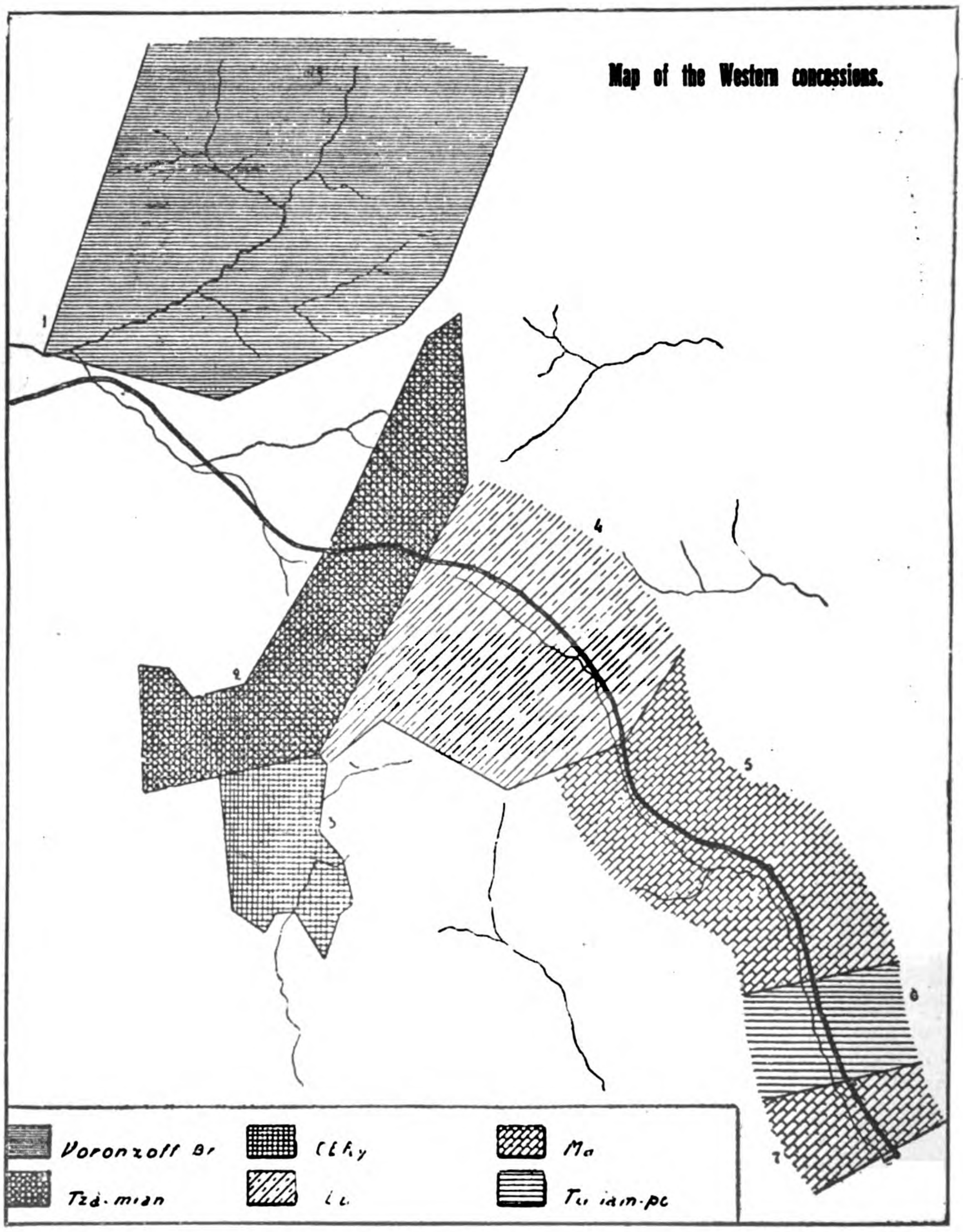
During the last year the oil-milling industry has largely developed in North Manchuria and is looking forward to a good future.

Oil-milling ranges second in importance among the branches of industry in North Manchuria. The country possesses more than 1,000 native mills and 56 steam mills, 45 of the latter are located at Harbin and the remaining ones are at various points of the railway line.

The value of the output from oil-mills equals about half of the value of products of flour mills. Bean-oil and bean-cakes are in great demand on both the interior and the foreign markets. Exports of bean-oil and bean-cakes are made partly to Europe and mostly to Japan. These products are not demanded in Russian territory, and for the Russian maritime province they have only the importance of providing export shipments to the Ussuri railway.

With the exception of the two above-named branches of industry, all other kinds of manufacturing industry take only a modest place in the economical life of the country.

In the first place should be mentioned alcohol distilleries, which transform up to 120,000 tons of grain a year. Out of the seven existing distilleries only one is locatest outside of Harbin—at Fuliaerhti. Beat-sugar factories are at Ashiho and Harbin leather factories—at Hailar, Manchouli and two at Harbin. A number of other industries should be mentioned: soap-factories, candle factories, molsses-factories, macaroni-vermicelli factories, tallow-melting plants, etc.



Western Siberia and the Altai Region

The Mineral Resources of the Altais

By Dr. Jacques K. Maguite

EDITORIAL NOTE:—"*In these mountains there lies an untold wealth of iron and copper and silver. Our explorers have reported that it is so. The iron mines of Lorraine are ours no longer and we must have iron. The Altai region is the richest mineral region in the world. Germans will go to that region in large numbers*"; *so said Dr. Jung, chief of the German government bureau of emigration, three years ago to Kenneth Roberts. The Germans knew what they were talking about. An expedition of their best engineers had made a two years survey of the region and submitted its report while the Moscow newspapers announced that a concession had been granted by the Soviet government to a German group headed by Hugo Stinnes which bore the title "The Development of the Mineral Wealth of Northern Altai."*

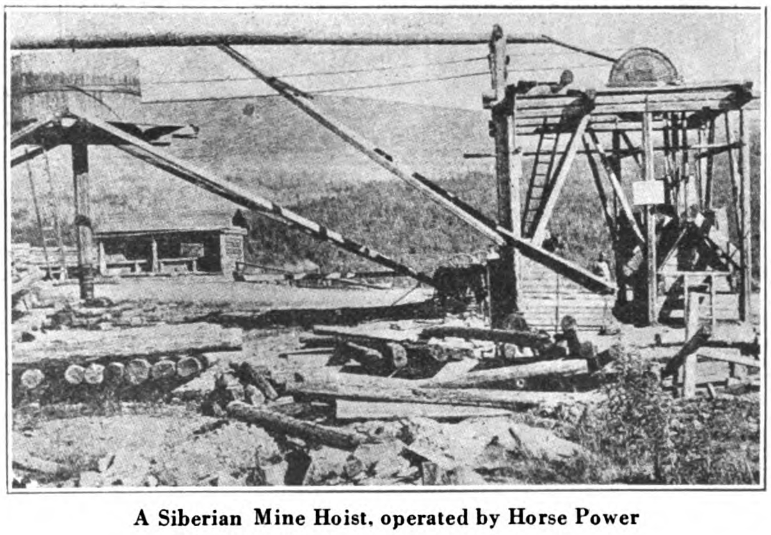
The Altai is undoubtedly one of the few remaining undeveloped regions of mineral wealth in the world. A large part of it lies in Mongolia, which, according to the principle laid down by the powers in the consortium agreement, is a most important part of the Chinese republic. China is powerless to assert her authority in this remote region, and there is little hope that the consortium powers will make any serious effort to give effect to their paper doctrine. The enormously rich Altai region will be absorbed by Russia. No power on earth can stop this, once transportation facilities make possible the opening up of the region. It requires only the improvement of navigation in the upper Yenesei and the construction of the Achinsck-Minusinsk and a few other branch railways to facilitate development of the Altai and the Uriankhai regions. Conditions in Russia are stabilizing. The trans-Siberian railway is getting slowly on its feet and in a few years we will be back to normalcy with the tide of emigration and the flow of capital setting towards the new elderado of Central Asia. The struggle for raw materials will be resumed on a larger scale than ever with every prospect of another clash over the control of this rich territory.

The following article is written by Dr. Jacques K. Maguite, a Russian engineer, who lived for many years in the Barnaul and Bishk districts and conducted a cattle business in the valleys of the western Altai.

* * *

The Altai mountain chain, situated between the 52° and 58° northern latitude and the 46° and 56° eastern longtitude, occupies the south-eastern part of the Altai and Tomsk provinces of eastern Siberia. The Altai district is a mountainous country of 500 versts in width with an area of 25,000 sq. versts. Altai is separated from Mongolia by the Sailugem range, and is itself composed of many mountain-chains. The highest of these is the Katunsko-Chuiskaya with several snow-capped peaks, among which is Beluha, 14,800-ft. above sea-level. On the slopes of these mountains are many glaciers, sources of great rivers like the R. Obi (Katun), while other streams are fed directly from the snow fields and mountain lakes. These streams flow along deep valleys, which sometimes widen into peopled steppes (Uimansakaya and Konskaya), sometimes narrow to dangerous gorges. The southern border of the Altai feeds the river Irtish. Here the most populated valley belongs to R. Buchtarm. The northern slopes of the Altai are covered with thick forests of fir-trees, in which, however, are found also foliated and cedar trees. Higher up are the rich mountain meadows where in the summer the nomads (inhabitants of Altai, Kirgizes and Telengites) live with their horses and cattle. These slopes are cultivated as high up as possible and are thickly inhabited by Russians who are quite prosperous, thanks to the natural wealth of the country.

In the northern part, the high Altais drop suddenly to a range hardly reaching the snow-line, called Kuznetzky Altai. On the wooded and marshy northern slopes of this range many streams are formed which feed the river Tom; the eastern slope feeding the Yenisei, the largest of whose tributaries is the Abukan.



A Siberian Mine Hoist, operated by Horse Power

On the Altai mountains we find besides the arid zones, the tundra, a little lower the pastures which in turn give way to zones of black fertile loam and desert.

On the south of Siberia and right up to the extreme east of the Altai region is found the remains of old mines belonging to pre-historic inhabitants, the unknown Chudi. These people mined silver and copper, as in those days the use of iron was as yet unknown. The tools found in some of these ancient mines served the Russians not only in uncovering the first workings in Siberia but even to-day, are often invaluable guides, in locating new mines. Thus, Peter the First having

heard of silver on the shores of the Shilka and Arguna, sent Greek miners there, who, guided by the remains of these ancient workings, discovered in 1698 the location of silver and lead and in 1704 the well-known Nerchensky factory was established.

A little later also with the help of the old Chudi-workings, copper was discovered in the Altai and in 1726 the Kolivano-Boskresensky smelting works was founded by Akinfin Demidoff, who three years later opened a similar works in Barnaul. Silver and lead mines were opened in Zmeinogorsk by the same person and in 1744 silver-smelting works were established. In the same year Demidoff established several smelters in the Semipalatinsk district, on the boundary between Siberia and Altai. To meet the needs of the Altai mining enterprises the Irbinsky Iron Works were established in the Yenisei province in 1740.

Much later, gold mining was taken up, if we do not count the gold found with the silver. In some years quite a considerable amount of gold was recovered with the silver. In 1772 the amount reached about 1,800-lb. However, the presence of gold in Siberia had a destructive effect on the mining industry of Altai.

The chief hinderance to the growth of the mining-industry is the lack of transportation and the scarcity of labor. As it is, most of the population of the district is engaged in gold mining.

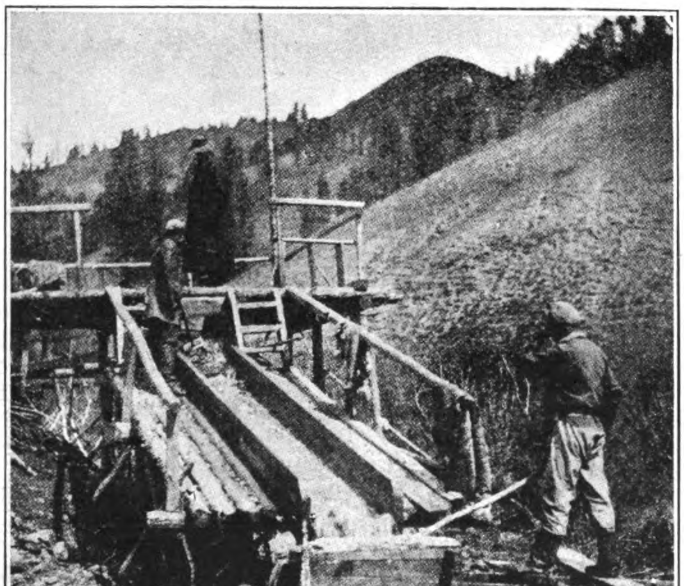
Gold Mining—The permission granted to several people in 1829 and 1831 to seek for gold gave rise to the discovery of gold between the rivers Tom and Yenisei.

The rocks in which gold is chiefly found is the so-called green stone (usually found in the shape of a horn of the kind known as : diorite, syenite and horn-shaped granite. On the eastern slopes of the Altais, lime-stone, sand-stone and clay is found ; but following upwards these valleys, highly metamorphosed rocks, are found which have greatly changed their appearance and shape, especially in the vicinity of granite and diorite. The stratas where gold is found are usually near these horne stone granites and diorites.

Almost all the gold workings in the Altai region are located in the perpetual frozen soil districts. This frozen condition has preserved these mines in perfect condition, a wonderful geological study for mankind. Here we find traces of the stone-age inhabitants who have left their arrows, stone-hatchets, utensils, bones, etc.

In the years before the world war more gold was mined, however this is due more to the more intensive work on the old mines, the early coming of spring, rainy summers, the price of bread, transportation, etc.

In the southern part of the Altai, gold-mining is being slowly developed, chiefly on the China border, where the price of gold is high and labor is cheap ; on an average 1,000 pickuls of ore yields from 6-8 and 13-15 dolias (one zolitnic=96 dolias=2.40 drams); in places, however, even 43-48 dolias are extracted from 1,000 pickuls. Favorable climatic conditions, abundance of water and the richness of the ore (sometimes the gold stratas is several dozens of feet thick) make gold mining very profitable in this district.



Washing Gold in Siberia

In the northern part of the Altai, in the Bisky and Kusnezky districts auriferous sands are chiefly found and only during the last ten years has ore been discovered.

Altai Mountain district.	1909 Outp. in poods	devel. mines.	1910 Outp. G. in poods	devel. mines.	1911 Outp. G. in poods	devel. mines.	1912 Outp. G. mines,	devel. mines.
Zmeinochesky & Salaisky distr. ..	18.4	12	19.7	12	30.6	20	30.1	20
Chisky & Kuznezky distr. ..	13.2	8	14.1	9				
Total	31.6	20	33.9	21	30.6	20	31.1	20

1 pood=36.11-lb. avoirdupois.

The above table shows the amount of gold mined in the period 1909-1912 from which we see that the amount obtained during the last two years is decidedly less. However revised information gave 22 mines at work in 1913 with an output of 29.2 poods, evidence that the output since that year has considerably increased.

Those interested in gold mining have to invest large sums before even beginning work, since they must pay part of their wages in advance to the laborers, and provide stores, food, and working utensils, as transportation to these districts is possible only in summer by using the water-ways. The need of large quantities of bread and other food by the laborers, as also the supply of other household goods offers good profits to the local populace.

Thus only the mines of the Altai district embraced in the former lands of the Czar's cabinet produced in 1913 only 38 poods and 60 per cent. of this was taken from the Zirianovsky, Gavrilov, Zmesvekam and Ruddersk mines. On the first three, the gold was found with silver, on the Ruddersk 4 poods and 17-lb. were extracted from gold ore. The gold mined in these properties was smelted in their own laboratory, loaded on caravans and sent to the railway for delivery at Petrograd.

Silver and Lead Mining.—The silver-lead industry in Siberia and the Altai districts (Nerchsky) was operated chiefly by the Czar's cabinet, although private workings were found in the Kirgiz steppes (Semipalatnei district). Although the industry was not of great extent the annual production of silver and lead in Siberia was greater than that of the whole of Russia. The amount of these metals mined during the last few pre-war years is shown in the following figures (6 poods):—

	1909 Silver	1909 Lead	1910 Silver	1910 Lead	1911 Silver	1911 Lead	1912 Silver	1912 Lead	1912 Silver	1912 Lead
Altai District ..	1,304	13,306	1,362	38,610	1,190	22,376	1,004	39,188	634	37,218
Nercheskly Distr.	100	14,792	110	15,654	110	19,106	116	20,440	120	22,360
Kirgiz Steppe ..	220	21,672	144	29,386	192	7,758	76	28,348	188	21,152
Total in Siberia	1,624	49,770	1,616	83,650	1,492	49,330	1,196	87,976	942	80,730
Total in Russia	2,012	82,304	2,002	126,510	2,712	81,556	2,314	142,112	1,742	

The beginning of silver smelting dates back to 1742 in the Zmeigersky mine, from which in 1744-45 2 poods, 25¾-lb. of silver was obtained. After 1747, the management of these mines came under the imperial cabinet. At the present time, the entire Altai district is managed by the Russian government. Over 1,150 silver mines have been located in Altai, during recent years only eight have been worked. The upper strata of these mines are more or less pyrite, but at about 70-100 sagen (1 sagen—1.16 fathoms) downward the soil becomes ocherous. The pyrite soil is much poorer in metal than the ocherous soil and is also much more difficult to mine. The ocherous soil contains from ¾ to 10 zolotniks silver in one pood, and from 6 to 12-lb. of lead.

Silver is found in the Altai either in veins situated on the border between loam layers and porphyrous layers or right in the porphyrous rock, which originally gave rise to mining shafts.

On the whole, all the mines of Altai may be divided into two groups. To the first group belong those of the southern part known as the Smeinogorsk district. The other group is located in the Salaisky district located in the north-eastern part. The only difference between these two groups is that the mines in the Zmeinogorodsky district uses wood almost entirely for smelting while the Salaurisk group being situated near the coal fields employs coal.

The Altai district during many years produced annually about 4,000 poods of silver but on account of political conditions in Russia the output decreased after the outbreak of the war, forcing the people to abandon mining for agriculture. The rise in the cost of labor brought in its train a number of consequences and with it a blow to mining. This, added to the fact that the mines changed in character, from the rich, easily worked ocherous soil, to the poorer veins compelled a stoppage of operations.

At the present time only the Gavrilsky smelter in the Salairsk district, is operating at a profit due to an abundunce of silver,

unusual facilities for mining and proximity to coal fields. With regard to the Zmeigorodsky district, the closing of smelters has not appreciably diminished the output as a chemical method of silver extraction is employed.

Copper Mining.—Copper mining in Siberia is insignificant and is chiefly carried on in the Altai district where there are several smelters under private management, some of which operate exclusively on copper ores and others obtain copper as a by-product of silver. The progress of the copper mining industry in pre-war years is shown in the following figures :—

	1909	1910	1911	1912	1913
From founderies.	pood	pood	pood	pood	pood
Altai district... ...	112,000	84,000	87,000	67,000	79,000
Kirgiz steppes ...	4,000	—	3,000	1,800	9,000
Total in Siberia ...	116,000	84,000	90,000	68,800	86,000

In the Altai, copper is obtained in conjunction with silver and also from shaft waters. From the latter during 1913, 10,000 poods of cement copper was obtained. At present, only the Suzunsk smelter is in action. The recovery of copper in this way can also be carried on in the Ziransky mines along with the mining of silver, and about 80,000 poods could be obtained.

New mines discovered in recent years cover an area of about 700 sq. versts. These hold out great prospects to the mining industry.

Graphite.—The recent discovery of valuable graphite deposits will assist in the future development of the Altai. The working of these mines under government supervision is at present under consideration by the officials of the mountain department.

Before the war the output of graphite mines in Russia was very insignificant. According to the figures given by an investigation committee the production was as follows :

1910-1912	None
1907-1909	3,300 poods
1913	300 „
1914	400 „

The domestic demand was supplied from abroad. Between 1911 and 1913, 226,000 poods valued at Roubles 395,000 was imported. The imports were clssified as follows :

Bricks	55 per cent.
Pencils, batteries, electrical uses	15 „
Mixtures for protection against heat ...	15 „
In steel factories	10 „
Graphite paint	5 „

The countries which supplied Russia were Germany (50 per cent.), Austria (24 per cent.), England (21 per cent.), Italy (3 per cent.), France (1 per cent.).

With regard to its graphite wealth the country has not even been scratched. The following information will indicate that the Altai alone could provide the graphite needed by the whole world.

The richest mines are in the Siberian Altai district where ancient graphite workings are found and in the Salarisk district on the Yenisei river. Graphite is also found in southern Ural and the Caucasus.

According to a report by German engineers the graphite deposits in the Salarisk district at the lowest estimate amounts to 20,000,000 poods, with a possible 100,000,000 poods. If we take into consideration that before the war the world consumption was 8 to 10 million poods it can be seen from the above figures that one small district can easily provide the whole world for 30 to 40 years with graphite.

Analysis of the Altai graphite shows :

Carbon	from 84.47	to 90.62 per cent.
Ash	„ 5.72	„ 14.3 „
Volatile salts	„ 0.918	„ 2.981 „
Moisture	„ 0.28	„ 0.45 „

In its physical composition, the graphite of this district is amorgous and therefore can be utilized in all industries wherein graphite is at all necessary. So far, the graphite has been only used for experimental purposes.

WORLD OUTPUT OF GRAPHITE (in large tons)

		1913	1914	1915	1916	1917	1918	1919	1920	1921
1.	Austria	48.6	37.4	34.4	46.5	46.3	44.0	47.4	—	—
2.	Ceylon	28.9	14.2	21.8	33.4	26.1	15.2	6.6	—	—
	graphite ...	10.9	10.9	6.0	8.0	11.9	11.4	7.5	—	—
3.	Italy...	9.3	8.3	6.3	8.0	11.0	7.1	4.2	4.1	—
4.	Korea	12.0	6.4	5.3	7.7	8.6	6.9	—	—	—
5.	Bavaria	11.8	13.4	17.0	30.0	42.1	63.0	29.9	—	—
6.	Indo-China	—	—	—	—	8.0	15.0	—	—	—
7.	Madagascar ...	6.2	7.6	11.6	25.4	34.0	14.3	2.0	14.01	—
8.	Mexico	4.3	4.1	4.1	0.4	0.4	6.0	3.9	—	—
9.	U. S. A.	4.2	3.8	4.2	7.2	12.1	11.5	10.2	12.7	—
10.	Canada	1.9	1.4	2.3	3.5	3.3	2.7	1.2	1.9	—
11.	France	1.1	0.3	—	—	1.6	2.0	0.4	—	—
12.	Spain	—	—	—	1.2	1.9	0.6	1.9	—	—
13.	Russia	—	—	0.23	0.3	0.35	0.55	1.1	0.9	2.0
14.	S. Africa	0.03	0.03	0.03	0.05	0.07	0.07	00.7	0.6	—
15.	India	—	—	0.07	1.3	0.1	0.12	0.12	—	—

and has shown fine results even in the production of bricks. Should further experiments reveal that the Altai graphite is unsuitable for the production cf bricks, the deposits would supply 25 per cent. of the world's needs (which is 2,000,000 poods) since 75 per cent. is used in the production of bricks.

Taking into consideration the calculations of the investigators we find that in spite of transportation difficulties to the railway and other expenses the graphite could be delivered at a cost price of 37 to 44 rubles per ton f.o.b. to any foreign port. With regard to the world market of graphite the price rose enormously with beginning of the war, due to the fact that almost 40 per cent. of the world supply was obtained from Austria and Germany. Since 1918, the price has fallen considerably and still shows a decided downward tendency.

To sum up we find that the prospects of the graphite-industry in the Altai district are very bright. Therefore it is probable that in the new Soviet Russia this branch of industry will bring untold wealth into the country. It is even expected that in two or three years 50 to 80 thousand poods will be mined of which 30 to 40 thousand will be exported bringing in a sum of 50 to 600 thousand rubles.

Coal Mining.—The coal fields of Siberia begin on the border of the Kirghis steppes and extend to the shores of the Pacific. However this industry is very little developed, due on one side to the general lack of development in mining transportation, and other industries and on the other hand to the small demand for coal in regions where fire-wood is abundant. During the past 20 years, however, the forests have been largely cut down along the railroad so that the need of coal has become very acute. The richest coal fields are found in the so-called Kuznesky basin in the western Altai province. This area occupies the space between the Altai on the east and the Salairsky range on the west, covering a vast area of over 40,000 versts (0.66 mile). In the south-eastern corner of this valley near the village Kaltansk a number of enormous coal veins have been discovered, the most important of which is called the Kunersky located on the left bank of the Kinerky river a tributary of the Kondom, which has a thickness of 4 sagen (1 sagen—1.16 fathoms). The field is estimated to hold 30 million poods. There is also the Kirchiaksky vein 7 sagen in thickness ; 7 veins near the Kiriak lakes known as the lake veins, 2 sagen in thickness, estimated to contain 22 thousand poods. The Aralchinsky vein, 6 sagen in depth, contains 30,000,000 poods. The coal deposits near the village Kaltansk is estimated at 100 thousand million poods.

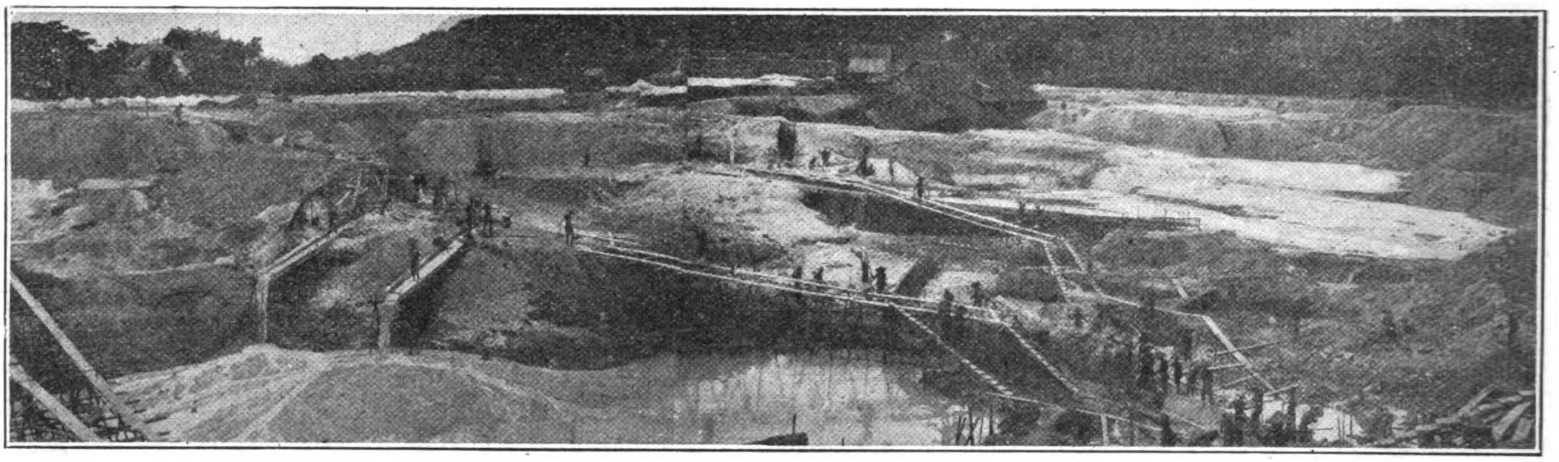
In the south-western part of the basin near the village Beresovka are found about 18 veins from 2½-ft. 5 sagen in depth with a store of 300,000,000 poods. Near the village Kostenskovo a sequence of 9 veins from 3-ft. 4½ sagens thick with a store of 50,000,-000 poods has also been discovered. Many more coal seams reaching a thickness of 3 sagen have been discovered in the southern part of this basin, and also some near the town Kuznesk on the banks of the Tom river.

Not inferior in wealth is the northern part of the basin. Here we find the only mines at present under operation, known as the Bochatsky and Kolchuginsky. These even have their own railway branch. The Bochansk shaft is about 27 versts from the Gurievsk foundry. The thickness of the vein here is uneven, sometimes reaching 25 sagen, some of the coal makes good coke while other veins produce a high-grade smokeless coal.

Here also are fields belonging to the southern Kuznesky basin which are enormous in size. On the shores of the Ini river are also fields with veins of ½-1 sagen in depth. Here is also the Kulchusk shaft.

The coal deposits of the Kuznesk basin have not been accurately estimated and the above figures are only approximate. The calculations have been based on small areas and only on those veins which lie above the nearest river level. In the southern part, how-

(Continued on page 148.)



Open Cast Tin Mine at Puket, Siam

Tin Mining in Siam

By G. R. Oswald in The "Mining Journal."

CONSIDERABLE misapprehension almost universally exists as regards mining affairs in Siam, where complete ignorance is not the case, and it is the purpose of the writer to describe briefly such developments as have already taken place, the factors which have influenced their success or failure, the lines on which future enterprise should best be directed, and the vital question of titles and security of tenure.

Apart from the dredges, tin is produced from native ground sluices, opencasts, and from lode outcrops and detritus. It is unfortunate that no distinction is drawn in the Siamese statistics between alluvial and lode tin, but the proportion of the latter is extremely small. In 1907 the equivalent of 4,312 tons of metal was produced from these sources, rising to 8,999 in 1915, and declining to 7,083 last year. Dredge tin rose from *nil* in 1906 to 3,030 tons in 1921, and is still increasing.

A great impetus was given to the west coast provinces of Siam by the unqualified success of the first dredge installed at Tongkah harbor in 1906, and thenceforward these provinces were energetically prospected, being readily accessible from Penang, with the result that various companies embarked on dredging, with output in 1920 as follows :

	Tons metal.	
Tongkah harbor	... 615	Still working.
Tongkah compound	... —	Exhausted a small rich area on which Puket government offices formerly stood, and was then transferred to another area in Malaya.
Deebook ...	... —	Dredge transferred to Ronpibun, after several years' work on Deebook mine.
Bangnon valley	... —	Suspended operations in 1919.
Ratrut basin ...	... 182	Still working.
Renong tin ...	... 460	Still working.
Siamese tin ...	... 763	Still working.
Takuapa ...	... 282	Still working ; East Asiatic Co.

Kundang tin was formed in 1920 to work land in Trang province, but went into liquidation the following year without result.

All the above are on the west coast, south from the Gulf of Kra, which washes the south end of Burma. On one of the Burmese Mergui Islands, the Austral-Malay company are about to put in a bucket dredge.

The only dredge in Siam away from the western provinces is at Ronpibun, in Nakon Sritamarat, and produces about 200 tons of metal yearly. This is the old Deebook dredge, which has been almost entirely rebuilt. A second dredge is being laid down at Ronpibun, and is stated to be of the suction cutter type.

The only failures have been where the ground was totally unsuited to dredging, and would not have happened had proper boring records been taken of the type of ground, and not merely the values entered.

Undeterred by the failure of the Kundang tin dredge, the Lampai Tin Mines, Ltd., are installing a suction cutter dredge in the Kantang district of Trang province.

The writer is of opinion that, in view of the careful way which the provinces on the western seaboard have been prospected, it is unlikely that any new areas suitable and large enough for bucket dredging will be there discovered, and that when the present mines are worked out the output will be limited to the spasmodic production of the native miners.

The tin provinces on the east coast of the peninsula are in somewhat better case. Since July 1918 there has been through rail communication between Malaya and Siam, and the eastern provinces of Patani (a Malay state ruled by Siam), Singora, Nakon Sritamarat, Surastr, and Langsuan have now begun to receive close attention from from prospectors.

Patani is the most northerly of the Malay states on the east coast, and the only one still under Siamese rule. At the western or upper end, in the Betawng district, is a group of mines worked by Penang companies by hydraulicing, and in some cases crushing lode detritus. None are of any importance. The ore is taken direct to Penang by road, passing through Kroh, in Upper Perak, thence through Kedah. A much larger quantity is shipped from the coast to Singapore from mines worked by natives nearer the coast. There have been reports of the discovery of ground suitable for dredging in this state, but those which so far have been investigated have been found useless for this purpose.

Singora province has been well searched, but so far no dredging areas have been located. The writer, however, has noted certain spots which he feels sure would be worth the expenditure required for proving them. Native mines which work alluvium during the wet season only, and one or two which work detrital material, account for the bulk of the production. Only one—Nam Noi mine—is owned by a European, and this is in an excellent situation alongside the railway. One distinct and rich tin lode has been located, and the owner, a Penang resident, was only prevented by the slump from getting the necessary plant. This mine, with reasonable capital expenditure, could be largely developed, and would form an excellent base for the discovery and acquisition of virgin areas in the neighborhood.

Nakon Sritamarat is by far the most promising of all the eastern provinces. At Ronpibun are several square miles of alluvium, part of which is being dredged, some hydrauliced by the Nawng Pet Mining Co., and other portions worked by natives. All the shallower rich patches have been "pock-marked" by former opencasts. In the sections worked by the two European companies the values are all deep, and are overlain by a thick bed of hard barren greenish clay. In both cases considerable power is wasted breaking this

up, and as it contains little tin, this work is profitless. In addition to this, once slimed the clay never settles ; many miles away from the dredge the streams are thick with slime. The Siamese authorities have recently, and rightly, determined to take a strong line about tailings, and difficulty is likely to be encountered by these companies on this account.

At Klong Chang, in Tungsong, the next county to Ronpibun, is a small hydraulic mine worked by a Penang company under French engineers.

There are several quite promising dredging areas in this province not yet taken up, though it is doubtful whether the large outputs of the west coast by this method will be equalled. The enormous cost of modern bucket dredges, rather than lack of suitable ground, is likely to curtail the development of this method in the future, and even the cheaper suction cutter dredges have their drawbacks.

The lode mines of Nakon offer great possibilities, and will be dealt with later.

Surastr, or Bandon province, to the north of Nakon, has hitherto produced tin from the country of Ban Na San only. Here one or two old-established mines were confirmed in their title when the first mining enactment was passed, twenty years ago, but the rest of the country, until a few months ago, was closed to mining. Many enthusiastic prospectors got a living for years from supporters in Malaya on the strength of their wonderful discoveries in Na San, and when their backers became restive and demanded to know when the mine was going to start paying its way, they would be told that no mining was at present allowed, but that the prohibition was likely to be removed soon, when " operations could start, and in the meantime, if the assets were not to be lost, further funds must be supplied " (to maintain the prospector).

While the writer has no doubt that good ground exists in Na San, he is sceptical as to abnormal values being found ; the district being now open to mining, developments should soon take place.

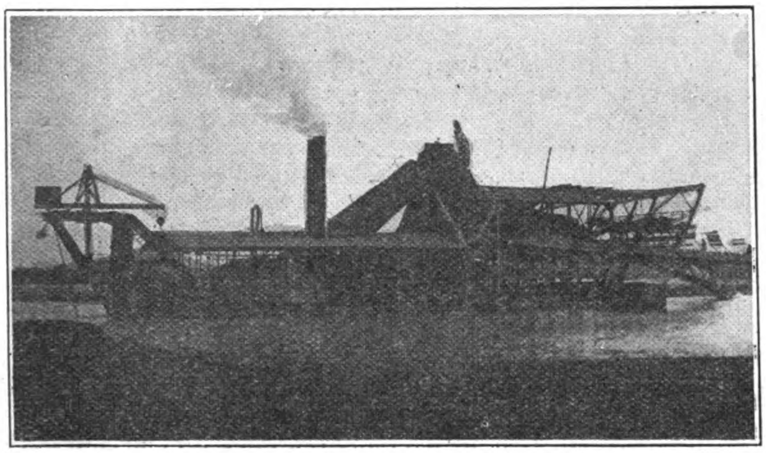
Koh Samui, an island off Bandon Bight, has for many years produced small quantities of tin, and nearly twenty years ago a Bangkok company laid down a small mill, but soon suspended operations.

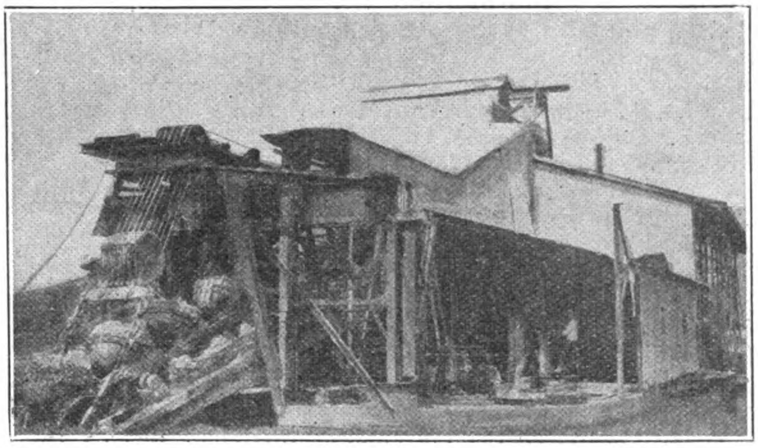
Langsuan province, adjoining Surastr, to the north, beyond a few small ground-sluicing properties, has only one mine, now idle. This is owned by a Bangkok Chinese, and the pipe-line and monitors of the defunct Langsuan Mining Co. are utilized. This company was floated in Bangkok over twenty years ago and heavily capitalized, expensive buildings and plant were erected, a large staff engaged, while the vital factor of thoroughly proving the property beforehand was neglected. After a brief ca eer the company suspended operations, and so disgusted the European residents of Bangkok that it would be difficult even now to float a public tin-mining company there.

Energetic recent prospecting, however, has been sufficiently successful to induce two companies—one American, the other Australian—to instal each a suction cutter dredge in Langsuan.

North again from Langsuan is the province of Chumporn, and, adjoining this, Ratburi. Small areas of tim have been worked from time to time for many years, and the provinces have been carefully explored, but it seems unlikely that any land suitable for a large mining company will be discovered.

Of all the east coast provinces, the writer considers Nakon Sritamarat to be the richest and the most likely to produce the largest output of tin over the longest period. Here we have what the Malay States almost completely lack—large numbers of lodes of convenient widths and high enough percentages to be capable of profitable operation. Usually only such lodes as contained wolfram only, or in which that mineral predominated, have been worked, the tin lodes being almost entirely neglected, and these mines are practically moribund now. Some have reached a depth of 100-ft. from the outcrop, and show diminution neither in width nor in values in depth. Practically all are in the mountains, and could be drained by adits for many years to come. The ore is usually patchy, but over many tons crushed uniform percentages are obtained. Out of every 100-lb. of quartz blasted out, the miner can usually at once discard 90-lb. as worthless ; he picks out the large pieces from the remainder, and only needs to crush fine and wash about 5 per cent. of the quartz. The Chinese miners are very efficient at the extraction of the tin, but painfully slow at drilling, while on some of the mines the men spend half their time raising water. In spite of this, the cost per ton of rock mined is only 21s. By keeping the men on the work they really understand, the recovery of the tin, and paying them as at present so much per lb., and relieving them, by the installation of rock drills, of the drilling, and by a proper lay-out of the raising of water, even allowing for European overhead charges, metallic tin from these mines could be delivered in England at a cost of £100 per ton, including export duty, mine costs, freight, and all charges. As no mill would be required, and only rock drills, hoists, and ultimately, perhaps, pumps, little capital would be required for equipment.





Tin Dredges at Tong Kah Harbor, Puket, Siam

As no development is ever done, options would be necessary to enable the holder to carry out sufficient drivages and pits to justify flotation. Some initial option money would need to be paid on signing, as the mineowners are very cautious in their dealings with Europeans.

Sufficient water-power is available to electrically operate all the mines in the neighborhood. Labor is plentiful and cheap, and free from strikes ; there is ample fresh food, fish, fruit, and vegetables, available in the neighborhood of the mines, none of which are more than 20 miles from sea transport ; and there are plenty of Siamese for building, jungle work, fossicking the dumps, etc.

There is certainly an excellent opening for a sound company to acquire and intensively exploit some of the existing mines, and gradually to obtain, by purchase or discovery, others. Working on these lines the capital for extensions would be derived from the mines themselves.

Sufficient labor could easily be obtained for such a company's operations, and, as in Malaya in the past, regular increasing immigration of Chinese would provide all the men required for progressive expansion.

Alluvial Mining other than Dredging.—The west coast provinces, as already stated, have been so thoroughly prospected that little expansion can be expected there. The Penang companies operating in the Batawng district of Upper Patani have not been very successful of late, and if there were any other large rich areas there they would ere this have been discovered. Lower Patani, now rendered accessible by the Bangkok to Singapore railway,

has been prospected fairly extensively, with disappointing results. Among others, the wealthy Anglo-Siam Corporation, of Bangkok and London, kept a highly-qualified engineer and staff in Patani for two years, but closed this branch of their business in 1921, which is significant.

In Singora there is nowhere a suitable water supply available for hydraulicing, except at a prohibitive distance from likely areas. There are quite a number of potential hydraulic mines in Nakon Sritamarat, which is the only east coast province in this position.

Climatic conditions are somewhat against the water supply in these provinces. In the Western Malay States, including the " wet season," rain falls to some extent probably on about 300 days in the year, usually at night (hence the success of rubber cultivation there), so that there is a constant supply of water at the hydraulic mines. In the east coast provinces of Siam there is a severe wet season, during part of which floods occur, from about the last week in October till the end of January. February, March, April, and the first half of May are dry and hot. From the latter part of May, and in June, July, and occasionally the first week in August, rain falls practically every afternoon, from 2 to 5 p.m. The rest of August, September, and the first part of October are very dry and hot. Hence, in equipping a hydraulic mine, it is best to put in much larger pipes than would be used in Malaya, so that the whole of the water available during the wet season can be utilized, and the work curtailed during the dry months.

Little attention had been paid to the tailings question by the authorities, but in 1919 a Bangkok firm started a gravel pump mine at Ronpibun, and, without any pretence at making a tailings area and dam, proceeded to dump their spoil directly into the river. The viceroy of the sourthern provinces was greatly incensed at this unwarrantable action, and the regulations are now being rigidly enforced. No hydraulic mining is now permitted within 44 yards of any stream, even a brook, which at any part of its course is used for public purposes, unless a heavy cash deposit is first made, which will be returned when the mine is exhausted, provided that no breach of the regulations has meantime been committed.

In view of the intermittence of the water supply and other points above noted, the writer is of opinion that, unless the bed to be worked carries values from near the surface down to bedrock, hydraulicing is unsuitable for Siam. Alluvial miners in the peninsula are often men of no technical training, and, expert though they no doubt are at their speciality, they are apt to scout new methods. It is surely better to adapt the plant to the mine than *vice versâ*. At the Newng Pei mine at Ronpibun, already mentioned, the hard clay is dropped by the monitor into the opencast, some 50-ft., where it has to be cut up by coolies with hoes before it can be slimed and raised over 70-ft. by the gravel pump. In such cases—and many are likely to recur in Siam—either underground mining should be adopted, or mechanical excavators used to remove the barren ground overlying the valuable alluvium. In the latter case the water-power will be doing profitable work all the time; in the former, coal-trained men would be necessary, but they could easily be obtained. Both these methods are new to the peninsula, but monitors and dredges were new also not so many years ago.

The writer has frequently heard vague statements that it is impossible for European companies to secure a footing in Siam, the authorities are antagonistic, etc. The history of the dredges already mentioned, showing that half the tin revenue is from these companies, is sufficient to disprove this. The Siamese government want to encourage foreign capital to enter the country, but they dislike the land, speculator, and intend to keep him out. Some disgruntled people whose cases have been investigated by the writer could only complain that the authorities refused to allow them to do things not permitted even to the native Siamese. Strict, though not arbitary, compliance with the law is insisted on, and in Siam, as elsewhere, tact and courtesy carry one a long way. Mining leases are perfectly sound titles, and when one is granted, there is no vexatious interference.

In brief, sound European companies entering Siam with a view to the acquisition and exploitation of tin mines, provided they employ competent engineers and not merely the cheaper untrained prospector, can rest assured of success, if they are content to conform to the law, and to adopt methods of mining which will not antagonize the authorities.

Mineral Resources of the Altais

(Continued from page 145.)

ever, the presence of 700,000,000 poods has been definitely located. It is said that in this district investigation is not necessary because coal is everywhere and it is only necessary to follow the outcrop.

The central Altai region is also rich in coal. Careful investigations have not been made, but coal is used as fuel everywhere.

The few private coal mining enterprises were stopped on account of the war, and only during this last year have feeble attempts been made to resume work.

To the above-mentioned wealth in the Altai plateau may be added the presence of precious stones, emeralds, topaz, amethysts, etc. Exact information about their location, however, is not available.

The Altai mining industry was under the management of Czar's cabinet before the war and very poorly equipped. Investigations were made only in those places favorably situated with regard to transportation. It came as a shock to the Russian public when the Soviet press in Moscow published a notice about the return of an expedition of German engineers from an investigation trip in the Altai, which had lasted two years. From private information it appears that this expedition was the result of an agreement made in 1921 between the Soviet government and a group of German manufacturers headed by Hugo Stinnes, under a concession which bears the name " The Developing of the Mineral Wealth of Northern Altai."

Rich Siberia Gold Belt

The Stanovoi gold belt of Siberia is heralded as " a potential discovery of far greater importance than any of the isolated Alaska or Klondike discoveries of the last century " by Chester Wells Purington, in a report to the American institute of mining and metallurgical engineers.

Since the receipt of this report, the result of several years of investigation, Purington lost his life in the Tokyo disaster in a vain attempt to save his two children after having rescued his wife.

Purington's report, based on exhaustive study of voluminous literature, maps and statistics, and many personal journeys and field inspection of various parts of Siberia, reaches the conclusions that " the area adjacent to the Stanovoi, Zhuged-Zhur and Yablonoi ranges is that which is accessible to the western world and will soonest give results from exploration."

The report after describing the history of the region, the beginnings of East Siberia mining, physical features and extent of the Stanovoi field, as well as other mineral deposits, asserts the existence of untouched stores of gold, saying:

" The Okotsk-Ulya region at seaboard constitutes a distinctly new discovery of alluvial gold which has every indication of containing a great commercial reserve. The well defined limit of the Okotsk sea gold field make it comparitively easy to conduct further exploration. Horse Bay is a definite limit of the field on the east and the mouth of Ylya in the south. In the streams tributary to Horse Bay not a colon of gold can be panned nor is there any magnetic concentrate. In the river Inys, only 15 miles to the west, gold is found of the same character as that in the rivers further west.

" Coming to the south limit, in the rivers to the south of Ulya and Ottay, signs of gold are far less prominent, although they exist for another 300 miles south to the Amur.

" This field itself is but the edge of what we have named the Stanovoi gold belt or area, scattered portions of which have already added $600,000,000 to the world's store of gold, and the major part of which is entirely unknown outside of Russian literature and professional circles.

" The development of aircraft, the increase of commercial shipping on the Pacific ocean, the better charting of remote seas, and altogether the increased ability of engineers and navigators to deal with rigorous sub-arctic conditions, will in the course of a very few years make the zone of the Stanovoi one of the accepted fields of economic exploitation, although the vastness of the distances will enforce the construction of roads from the ocean through the mountain passes to the interior."

Japan's Chemical Industry

Detailed Account of Earthquake Damage to Sulphuric Acid Plants

THE Japan Artificial Fertiliser Company has many factories throughout the country, those located in the earthquake area being at Oji, Kamayabori, Komatsugawa, Kinoshitagawa, Koyasu, and Yokohama. At the Oji factory one-tenth of the sulphuric acid plant was destroyed, and one-quarter of the electrolysis plant. Entire reconstruction of the factory will need six months. There are ample stocks of fertiliser on hand. The factory at Kamayabori was demolished by the earthquake and gutted by fire, but it is expected that 70 per cent. of the stocks of fertiliser are commercially saleable. At the Komatsugawa works three of the retorts (?) for making sulphuric acid collapsed and the roof fell in. It is hoped that reconstruction will be completed in two or three months. The amount of damage at the Kinoshitagawa works was comparatively small. The works at Koyasu and Yokohama were burnt to the ground, but at the latter the phosphorite and another storehouse as well as the office and factory remain. The total losses occasioned by the earthquake amount to 4,650,000 yen.

The Tokyo Sulphuric Acid Company manufactures concentrated and fuming sulphuric acid by synthetic processes. The damage sustained is almost nil, and given a supply of motive power operations can be resumed immediately. About a month's supply of raw material is in stock.

General Chemicals

The Asahi Electric Industries are manufacturers of bleaching powder, caustic soda, solidified oils, hydrochloric acid, soap, etc. Damage is slight. A boiler-room and one shed partly collapsed, and a quantity of manufactured salt was washed away. It is anticipated that there will be no reduction in output. The Kameido works of the Japan Chemical Manufacturing Company which manufactures barium sulphate, iodides, cosmetics, fertilisers, etc., suffered little damage other than the collapse of one building, a brick chimney, and a water tank.

The Iriye Chemical Manufacturing Company possesses a factory at Sendagaya, Tokyo, and manufactures acids, brewing materials, ethyls, etc. No damage other than collapse of a store. There is a shortage of certain raw materials and an entire lack of stocks. Repairs necessary to a portion of the works of the Imperial Alloy Refinery, which collapsed, will have no serious effect on the factory's activities, and it is proposed to resume work as soon as there is a demand. As regards raw materials there is a shortage of ferro-silicon. In the case of the Mukojima (Tokyo) Plating Co., who are makers of zinc plates, the damage is slight. There is a shortage of ammonium chloride, but work can be resumed on receipt of supplies.

At the Central Rubber Company's Honjo works there was damage to boilers and chimneys. Owing to complete lack of materials like calcium carbonate, litharge, carbon black, sulphur, petrol, grease, machine oil, etc., it is impossible to resume for the present. At the Fujikura Company's Osakicho works, where waterproof cloth, and aeroplane dope are manufactured, in addition to the destruction by fire of the laboratory, part of the works were damaged, but when motive power becomes available it will be possible to resume without a decrease in output. Part of the drying-room at the Sasazuke factory of the Japan High-class Paint Company collapsed, and some raw and manufactured materials were lost; but general damage was small. Two or three months are necessary for repairs, but work is not interfered with, and the middle of October should see a resumption of activity.

The Taisho Turpentine Company at Shinagawa, manufacture turpentine and preservative chemicals. Laboratories were demolished, and no stocks of raw materials or manufactured goods are on hand. Resumption is not yet decided upon. At the Taktae factory of the Japan Printing Ink Company, offices and sheds were burned. A stock of one month's supply of raw material is available.

Matches, Scientific Instruments and Glass

At the Maruyama Match Factory at Shirokane (Tokyo) no damage was sustained other than that to part of the pans, and work can be resumed immediately raw materials are received. There were four factories in Tokyo, three of which were gutted by fire, leaving only the one at Shirokane. No stocks exist. The Takachiho works at Hatagaya manufacture microscopes, microscopic slides, spectroscopes, etc. There has been practically no damage, and the factory's activities can readily be resumed. The greater part of the Asahi Glass Co.'s Tsurumi factory suffered severe damage and will have to be entirely rebuilt. Reconstruction will take from six months to a year. The Tachibana Glass Company (Shinagawa) are manufacturers of table ware, glass for electric lamps, etc. Damage is slight and early resumption probable. There is, however, a shortage of soda ash.

Losses to Cement Industry

The Fukagawa works of the Asano Cement Company were utterly destroyed by fire. One-third of the Kawasaki works was damaged. Reconstruction of the former will take one year and of the latter three months. The capacity of the Fukagawa works was 60,000 barrels per month and of the Kawasaki works 150,000 barrels, but in a few months a capacity of 100,000 barrels should be developed by new equipment at the Tsurumi works. The stocks at both factories cannot be used. The company has also factories at Moji with a capacity of 220,000 barrels, in Hokkaido 120,000 barrels, and in Formosa 60,000 barrels. The Hokkaido factory is to be enlarged in the near future so as to have a capacity of 220,000 barrels. It is anticipated that the total capacity will then be 710,000 barrels and there is no fear of shortage.

Shortage of Cylinders at Oxygen Factories

The Oshima Clay factory of the Tokyo Gas Company manufactures benzol, toluol, creosote, sulphate of ammonia, naphthalene, etc. Little damage was suffered and early resumption is anticipated.

At the Osaki factory of the Oriental Oxygen Manufacturing Company there was no damage to buildings or machinery, but there was a great loss of cylinders, and about 700 pumps were destroyed by fire. Every effort is being made for speedy reconstruction with no diminution of ouput. The Tanabe Oxygen Manufacturing Company's factory at Oshima was not damaged, but a large number of cylinders were lost. With regard to the Japan Oxygen Manufacturing Company's factories at Osaki and Kameido, there was practically no damage at the former and there is a possibility of early restoration, but at the Kameido factory wooden sheds were destroyed and 1,200 cylinders were lost. As soon as motive power is available work can be restarted, but in view of the shortage of containers there must be a decreased output.

"Hakusan Maru"—New N.Y.K. European Liner

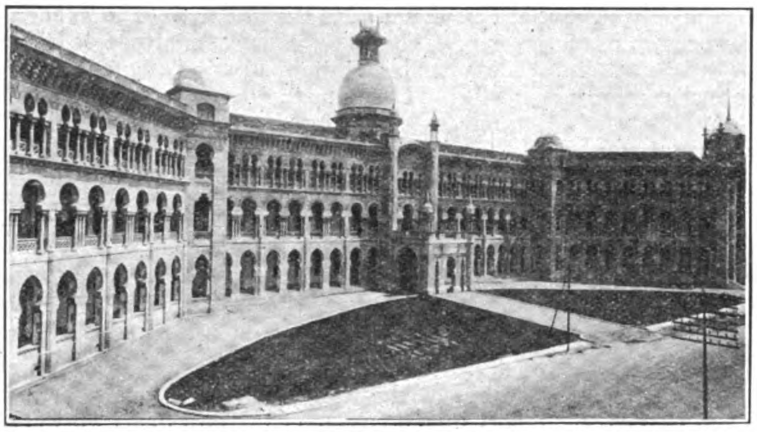
A NOTABLE improvement was made on the N. Y. K. Japan-Europe line, when the new liner *Hakusan Maru* was put on the service replacing the smaller s.s. *Kitano Maru.*

The *Hakusan Maru*, built at the Mitsu-Bishi Dockyard and Engine Works at Nagasaki, is the fourth of the "H" class passenger liners and is a sistership to the *Hakone Maru, Haruna Maru* and *Hakozaki Maru* already on the line. She is 515 feet long, 62 feet wide, 37 feet deep and of 10,423 tons gross and 18,850 displacement. Her propelling machinery consists of two sets of Parson's turbines of the latest type with double reduction gear, which enables her to maintain a speed of 16 knots.

The ship can carry 116 first class, 55 second class, 32 intermediate class and 102 third class passengers. The *Hakusan Maru* is installed with every modern convenience and comfort. The first class public rooms include a large dining saloon, a spacious lounge and music room, a writing room, a comfortable smoking room, and a children's room.

They are all conveniently located and neatly furnished. The verandah café, which occupies a most commanding position abaft, is one of the many attractive features. Great care has been used in designing and constructing the second and third class quarters which are remarkable for the provision of spacious room, efficient ventilation and lighting and complete sanitary arrangement.

In addition to being a superb passenger liner, the steamer has excellent facilities for handling cargo. Her loading capacity is 11,200 tons' deadweight and 13,000 tons' measurement, the *Hakusan Maru* is the first and the only liner in Japan to have a gyro compass installed.

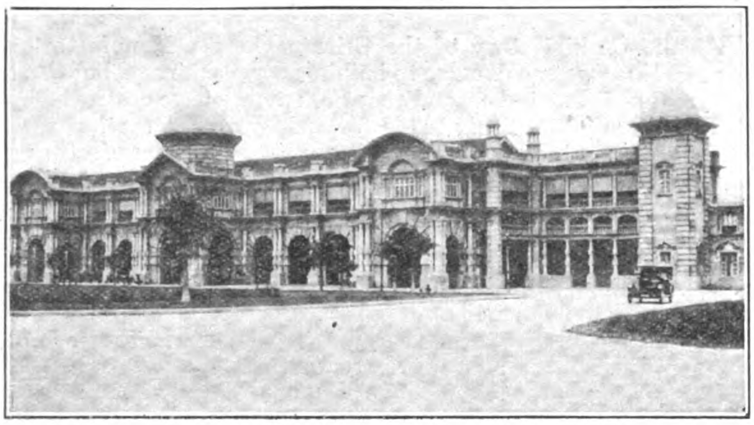


F.M.S.R. Head Offices at Kuala Lumpur

Architecture on the F.M.S. Railways

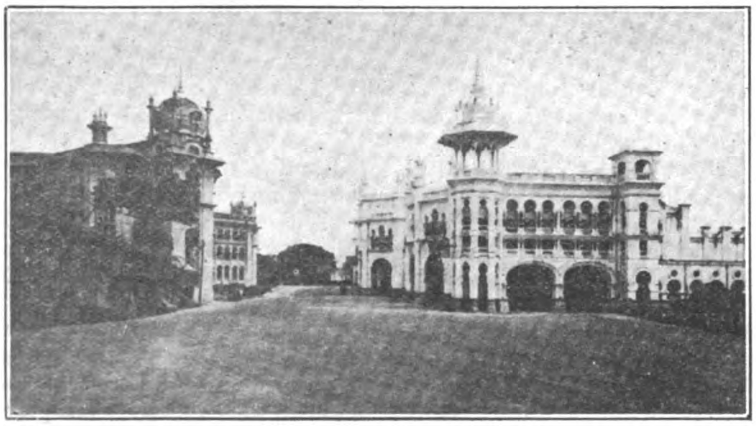
CONSIDERABLE development has taken place in recent years in the provision of modern station buildings, administrative offices and hotels on the Federated Malay States Railways, and the following notes and accompanying photographs are descriptive of the more important buildings :—

Ipoh Station and Hotel.—This station has three platforms with umbrella covering. The station offices and the hotel building are combined, the greater .part of the ground floor of the combined building being taken up by station accommodation. The style of the building is free renaissance with centre dome and two flanking towers, built partly in brickwork and partly in concrete blockwork, with concrete columns, mouldings and balustrades, finished in cement rendering lined up as stone work. There is a dining room on the platform floor with seating accommodation for 90. On the upper floor there are 17 double bedrooms with private verandahs, also three sitting rooms. Water-borne sewage disposal discharged into septic tank. Electric lift to all floors. Commenced in 1913 and finished in 1916.



Ipoh Station and Hotel

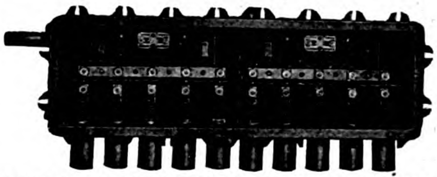
Kuala Lumpur Station and Hotel.—Four platforms are provided under a continuous roof; the station offices and the shipping and hotel building are combined, the greater part of the ground floor of the building being taken up by station accommodation. The site of the combined building is free benzantine built in brick work plaster mouldings and cast concrete columns and balustrade. Thirty double bedrooms are provided together with a large dining room with accommodation for 90, and three large lounges. Electric lift to all floors. Commenced in 1908 and finished in 1912.



Kuala Lumpur Station and Hotel

Central Railway Offices, Kuala Lumpur.—In this building are housed the chief executive and administrative officers of the Federated Malay States Railways. The style is free benzantine, built with cast concrete columns, mouldings and balustrades and finished with cement rendering lined up as stone work. Electric lift to all floors. Commenced in 1914, finished in 1918.

Plans are now being prepared for a new terminal station in Singapore, new district railway offices in Kuala Lumpur and for annexes to the Kuala Lumpur and Ipoh station hotels.



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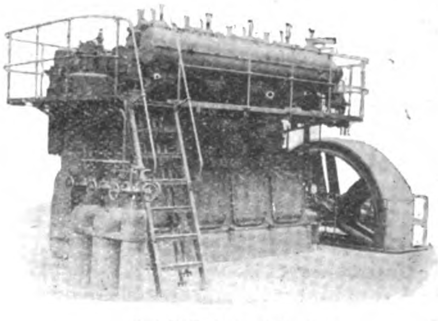

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

FAIRPLAY FOR JAPAN

After Excluding Japanese from America, Affronting their Government, Driving their Shipping from the Pacific and Opposing their Vital Policies in Manchuria, where will Japan find an Outlet?

AN AMERICAN SPHERE IN CHINA
"TOMMY ATKINS" IN TIBET
GET BEHIND "BILL" CAREY

AUTOMATIC TELEPHONE IN CHINA
ELECTRIC LOCOMOTIVES IN JAPAN
FUSHUN OIL SHALE PROJECT
SINGAPORE TRAMWAYS
CHINESE WOOD OIL
RAMIE
NEW CEMENT PLANT

Vol. XX April, 1924 No. 4

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A. L. TAYLER

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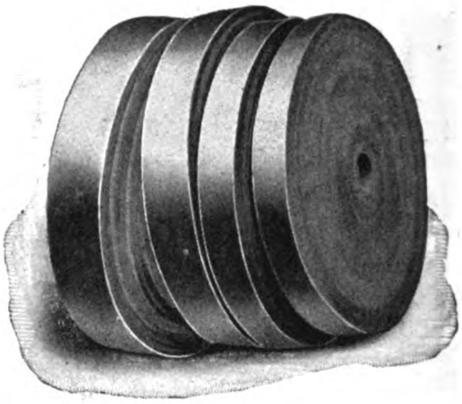

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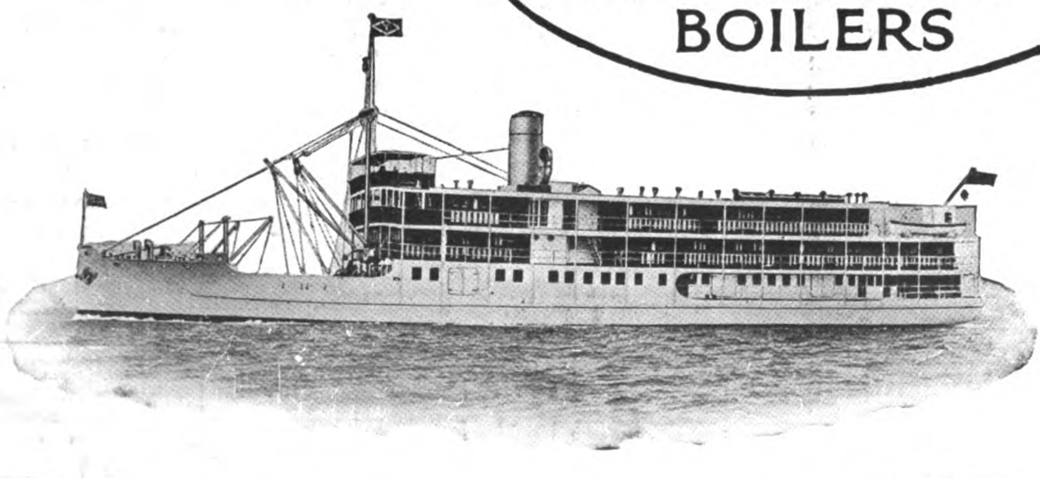

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, APRIL, 1924 No. 4

Japan Asks for a Square Deal

Picture No. 1: The Johnson Immigration Act

Japanese May Not Enter the United States—A Gratuitous Affront

By Geo. Bronson Rea

ALL efforts to eliminate from the Johnson immigration bill the discriminatory clause barring Japanese subjects from entering the United States has been met by uncompromising opposition from the Pacific coast congressmen and senators who seem determined to wantonly insult Japan against the advice of not only the highest officials of the administration but contrary to the interests of the manufacturers and toilers of the eastern states. Editors of responsible newspapers are asking: Why? There must be some good reason to explain why a quota basis which would limit their entrance to 246 immigrants a year is opposed by the Pacific coast legislators. This is a ridiculously small number, yet it would save the face of Japan and satisfy the honor of a proud and sensitive people.

In asking the question, *The Philadelphia Ledger* remarks :

"We protest our friendship for Japan. On their island they are a splendid, a wonderful people. Our hearts go out to them, and so do our salesmen. While the broad Pacific rolls between us we are eager to receive—by cable—their orders for American goods, and their remittance—in gold or trade. But we do not want them as citizens ; we do not even want them as immigrants debarred from the right of citizenship. We say to them, with Shylock, "I will buy with you, sell with you, talk with you, walk with you, and so following ; but I will not eat with you, drink with you, nor pray with you."

Why? Secretary Hughes asks the question of the house immigration committee, which is ready to exclude the Japanese immigrant in a manner so marked and offensive that, as he says, it likely "would largely undo the work of the Washington conference on limitation of armaments, which so greatly improved our relation with Japan."

"Why? It is a fair question."

The *Boston Post* says : "It is an old combination of circumstances that at the very moment when the new Japanese 'earthquake' loan of $150,000,000 is going very well indeed here in the United States, and especially out in California, where they regard the man from Nippon as a good deal of a menace, congress should be considering a section of the restriction of immigration measure that would exclude Japanese from this country entirely.

"Secretary Hughes departs from his usual custom, and flatfootedly says that the measure ought not to pass. In a letter to Chairman Johnson of the house immigration committee, he declares : 'I am unable to perceive that the exclusion provision is necessary, and I must strongly urge upon you the advisability in the interests of our international relations, of eliminating it.'

"Such a ban would be totally inconsistent with our treaty obligations to Japan, and would endanger the success of the reduction of armament agreements, which the Japanese signed with the utmost good will. Why at this period of history deliberately affront a friendly power. Mr. Hughes is right."

The *Jacksonville Times-Union* asks the question in these words :

"What is the use of telling Japan that we do not mean to be discourteous when the proof is so plain that that is just what we do mean. On the part of the American government and of the American people in general there is no ill will towards Japan but there is intense ill will on the Pacific coast and the men who cherish this ill will have votes.

"A few days ago Secretary Hughes suggested that Japanese be admitted to this country on a basis of the Japanese population of the United States in 1890. This would admit fewer than 250 Japanese a year and would not be an insulting discrimination against Japan. Why could not this be done if we do not mean to be discourteous?

"Why are we so willing to insult Japan? The Japanese are not more objectionable than the people from Eastern and Southeastern Europe and Japan's good will is of vastly more importance to us than the good will of the nations of that part of the world, or for that matter, the good will of the nations of any part of the world. Japan is right beside the weakest spot in America's defense and yet to please a part of the people of a small section of the country we insult her when we could accomplish our purpose just as effectually without giving cause for offense."

That the affront is gratuitous is emphasized when it is understood that the Japanese government does not desire to force its people upon the United States. With Japan it is essentially the recognition of an elementary principle of international intercourse. As explained by Ambassador Hanihara at the last annual dinner of the Japan Society held in New York on March 10 : "it is the question of whether the Japanese as a nation, and not as individuals, are entitled to that respect and consideration by other powers, which they, by common consent, accord to each other, and which form the basis of amicable intercourse among the nations of the civilized world.

"With Japan," he said "it is not the question of immigration or emigration as it appears to be commonly understood. As far as Japan is concerned there is no question of her sending more emigrants to this country. Not only did we declare our intention at the time of the conclusion of the present commercial treaty of 1911 between your country and mine, to exercise voluntarily control over the coming to this country of our emigrants who are not desired here, but we have been most scrupulously and effectively carrying it out in deed. The facts in possession of your government will prove it, in spite of the persistent allegations to the contrary. If you choose to restrict your immigration it is your own affair. Another country has no right to complain about it so long as such restriction is imposed in a manner conforming to the terms of treaties and involves no arbitrary or unfair discrimination against other nations.

"With Japan the question, is not one of expediency—of whether Japan be allowed to send a few hundreds more of her emigrants to this country or not—but one of principle : of whether her self respect as a nation should be given proper and friendly consideration or not."

Supplementing the above clear-cut declaration of his ambassador, Premier Kiyoura expressed the confidence of his government that "America's sense of justice and consideration for the sensibilities of others" would determine her ultimate action. In view of the reasonableness of Japan's modest request for courteous treatment, and the renewed agitation on the part of California interests to affront her wantonly, the rest of the country is entitled to ask, WHY!

Picture No. 2: The Jones Act

Driving Japanese Shipping from the Pacific

THE United States shipping board and the interstate commerce commission have decided to enforce Article 28 of the U. S. shipping act after May 20. If this law is applied no cargo will be obtainable by Japanese ships on the trans-Pacific services after that date. The Pacific freight conference will crumble and business will be practically monopolized by American steamships. Article 28 prohibits American railways from charging special low rates for passengers and freight transported by foreign steamship companies on a through traffic arrangement. It has never been enforced because of protests from foreign governments, the railways and Pacific coast chambers of commerce.

The operation of Article 28 will nullify the agreements between the trans-continental railways and foreign steamship lines and make it impossible for the latter to further enjoy advantages under which they have hitherto been operating. The difference between the two rates are shown in the following table :—

EXPORTS FROM JAPAN

	Railway charges	Freight rates of Pacific Conf.
	(Unit dollar)	
Tea (a)	1.50	.40
,, (b)	4.80	—
Porcelain (a)	1.50	.50
,, (b)	3.88	—
Matting (a)	1.50	.40
,, (b)	3.98	—

EXPORTS FROM THE UNITED STATES

Metal manufactures (a)	.72	.25
,, ,, (b)	1.30-2.70	—
Machinery (a)	1.15	.40
,, (b)	2.50	—
Automobiles (a)	3.65	.40
,, (b)	4.95	—
Raw cotton (a)	1.17	.45
,, ,, (b)	1.66	—

(A) indicates the rate on goods carried by American ships, and (b) by foreign steamers.

The rate on raw silk is 9 dollars per 100 *kin* at present but the rates to be applied after May 20 are unascertainable.

If Article 28 is enforced after May 20, the joint traffic arrangement between the Nippon Yusen Kaisha, the Osaka Shosen Kaisha and the Northern Pacific trans-continental lines terminating at Seattle, will be nullified and these two Japanese steamship companies driven out of the American trade. The O.S.K. which has done more to put the port of Seattle on the map than any other factor will be hard hit. Last year it declared a seven per cent. dividend, while the Toyo Kisen Kaisha operating out of San Francisco showed a loss of Y. 2,510,000 for the year. The plan for amalgamating the T.K.K. with the N.Y.K. having fallen through, the former company will be able to carry on only by drastic retrenchment in all lines of its activities.

The other side of the picture shows the Dollar Steamship line of California acquiring from the U. S. shipping board seven of the famous " President " liners at a cost of $3,850,000 and given until March 15, 1936, or thirteen years, to pay it in—one of the most liberal subsidies ever granted by any government to a steamship line. These ships cost nearly $30,000,000.

The Admiral-Oriental line operating out of Seattle despite Japanese competition, did a remarkable business in 1923, dispatching 71 full cargoes to the Orient. They have a fleet of five passenger liners and 12 cargo vessels with a total of 146,411 gross registered tons or 168,354 deadweight tons. During the year it handled 758,818 revenue tons of cargo. The Dollar, Pacific Mail and the Admiral-Oriental lines got their fair share of the westbound trans-pacific business but were not so fortunate in the homeward cargoes. In fact, as Mr. A. F. Haines, general manager of the Admiral-Oriental Company, pointed out in an address before the officers of his line, " the company's greatest difficulty is the lack of homeward cargo. Vessels," he said, "are obliged to return in ballast. The entire round trip expense must be borne by the outward freights."

Here is food for thought. The proposed rates as outlined above on principal commodities will give the American ships the preference coming and going, enabling them to dominate the Pacific trade.

In other words, the Japanese ships will be driven from the Pacific. In the face of this serious menace, do we hear the Japanese people hurling insults at America ? Not at all. In the same way they have approached the immigration bill now before congress, they appeal to American sense of justice and fair-play. The O.S.K. will be harder hit than any other Japanese shipping company, yet its vice-president Mr. Shozo Murata, tells his people to be patient and appeal to the intellect rather than the emotions of the American people; to call attention to the problem in a quiet and unostentatious manner.

" I believe" he added, "that immediate enforcement of the shipping law under discussion is a play on the part of Washington politicians for the support of capitalists and industralists preparation for the general election to be held in the United States in November. " Such a discriminatory law will, I am sure, encounter strong opposition from fair-minded statesmen and business men in America who have the sound development of trans-Pacific trade at heart."

Mr. Murata stated that he had been informed from reliable sources that strong opposition to the enforcement of the preferential shipping law would be registered by the combined chambers of commerce of the Pacific coast, by Pacific coast ports, by the American railways which have been doing business with Japanese steamship lines for many years in the past, and also by statesmen who, although living in the East, do not see any immediate gains in political prestige to be obtained among their constituents, and will oppose the proposal from an impartial standpoint. He advised strongly against starting any vigorous agitation that might be calculated to accomplish more harm than good.

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Japan's Only Outlet

Picture No. 3: Diverting the Racial Issue to Central Asia

JAPANESE cannot enter the United States on an equal footing with the white races of Europe. They are barred from Canada, New Zealand, Australia and British South Africa. If they emigrate in large numbers to some South American country, exclusion laws will be enacted to keep them out. The population of Japan is increasing at the rate of 700,000 a year. In twenty-five years at the present rate of increase, there will be 100,000,000 Japanese subjects. Where are they to go ?

Formosa is no outlet. The Hokkaido may absorb a few million. The Philippines as an independent state would be compelled to open its doors to Asiatic emigration. A few million Japanese might find homes under the Katipunan flag. There is no room for them in Java. It will not be long before the Dutch will have to encourage emigration from this overcrowded island to people their other East Indian possessions. The swarming lands of the Hindoo and the Chinese offer no solution to Japan's problem. What is the remedy ? Birth control ? Unsexing the males ? They would object to that. The laws of nature will prevail and the Japanese will increase. While we are discussing the problem millions of new Japanese are entering the world, preparing for the struggle for existence. Where will they go ? Argue as we will, talk about it until we are blue in the face, the world cannot escape the cold hard facts of an actuality.

The Japanese must either have an outlet or remain at home. If the latter, they must live. The nation will become a hive of industry, buying its raw materials from all parts of the world and selling its manufactured products in exchange for food. In the keen struggle for existence they will undersell other competitors in the markets of the world and if we place obstacles in the path of their shipping we strike at their right to exist. Japan will become a second England, her very lifeblood extracted from the ocean, from her shipping and foreign trade.

The Japanese cannot colonize China. They cannot own land outside the treaty ports until extraterritoriality is abolished. It is well for other foreigners to keep this fact always in mind. The exclusion laws of the West are forcing the Japanese into a corner, where their only hope of racial survival lies in having an outlet on the mainland and here for the present they are barred from owning and working the land by the application of extraterritorial principles. The day must come when the immigration policy of the West will compel Japan in self-defense to join her

demand to that of China for the abolition of treaties which operate as the last barrier to her right to exist. That day cannot long be deferred, and with these barriers removed the surplus millions of Japan will find a home under the rainbow flag of the flowery republic. Here, there are no racial antipathies. The Chinese and Japanese will intermarry, they will assimilate. The Chinese may perhaps absorb the Japanese, but in the last analysis blood will tell. Japan and China will come together and unite in a solid front against those peoples whose laws confine them to Eastern Asia.

As Japan's millions are mounting so the Chinese are multiplying, how rapidly, no one can tell. Such statistics as are available indicate that the Chinese are doubling their numbers in 33 years. Is it too much ? Let us say they are doubling their numbers in fifty years. In the next quarter century, within our lifetime, there will be another 200,000,000 Chinese. But this is the Yellow Peril our readers will say. Granted. Cut it in half and say the Chinese are less prolific than the white-man. Let us take a dose of hop and dream that he is doubling his numbers in 100 years. In the next twenty-five years there will be 100,000,000 more Chinese. Add to this the 30,000,000 subjects of the Mikado. Where will these 130,000,000 people find homes ? There is only one place in the world for them. In Manchuria, in Mongolia, in the waste places of China, Sinkiang and Central Asia.

If we block their legitimate expansion in this direction the laws of nature cannot be set aside. The flow will be diverted over the seas, across the Pacific, to somewhere in the Americas. Keep this picture in mind and then glance at the other presented by Russia. Here we find a population of 190,000,000 doubling their numbers in fifty years. In twenty-five years there will be 100,000,000 more Russians. Behind the Slav stands the Teuton with a population of 60,000,000 increasing at the same rate. In the same length of time there will be 30,000,000 more Germans whose emigration into the lands of their late enemies will be prohibited. The Teuton must find his outlet in Russia, in Siberia. In fact, that is the program of the German government. Here they will find 100,000,000 Slavs with their faces also turned towards Central Asia. On one side of the picture we seen at the most conservative estimate, 130,000,000 Mongols spreading over the lands of Manchuria, Mongolia, Sinkiang and pressing onwards into Central Asia. On the other side we see the Slavonic hordes pushed forward by the Teutons working eastwards towards the same goal. The racial question if not diverted by amateur diplomats will be settled in due time where it belongs; on the plains of Central Asia and between the peoples most concerned.

If Slav diplomacy, backed by the full weight of Central Europe, succeeds in diverting the Mongol tide from its natural channel, the racial issue will be again shifted to the Pacific for America to face and solve. We have more than once expressed our views on this problem. We see no good reason why American enterprise or American diplomacy should stand in the way of Japan's legitimate expansion in Manchuria, as any interference that will strengthen the diplomacy of Russia and divert the racial movement from its natural channels can only result in forcing it over the Pacific. Our stand on this question is eminently American. We see no reason why the boys of the United States should be called upon to fight Japan in the Pacific in order to consolidate Russia's hold on vast territories in Central Asia stolen from the Yellow Man and now needed for his expansion.

If Japan is to live she must seek her outlet in Asia, in Manchuria, in Mongolia. After closing the doors of America to her people and driving her shipping from the Pacific, it is the height of injustice to follow her up, in Asia and stand between her and her right to live. Are we doing this ? Let us look at another picture.

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Japan's Struggle to Exist

Picture 4 : Driven into a Corner

HAS America stood in the way of Japan's legitimate right to exist ? Let us examine briefly the high points of history.

Japan fought China in 1895. The giant of Asia was defeated and forced to sign a humiliating peace, ceding to the victor amongst other possessions, the Liaotung peninsula. Fearful of the spread of Japan's influence on the mainland, Russia induced France and Germany to support her and demanded from Japan the return of Liaotung. Before this coalition of the three strongest military powers of Europe, Japan complied, accepting instead a cash indemnity. A grateful China then sent its most powerful viceroy to St. Petersburg and there entered into a secret treaty of alliance with her northern neighbor. To enable Russia to get into a better position to crush Japan, China ceded the rights to the Chinese Eastern Railway, surrendered her sovereignty over the railway zone and later on in 1898, leased the Liaotung peninsula to Russia as a naval base, the very territory Japan had been compelled to relinquish.

While these events were happening, John Hay, the American secretary of state, promulgated the "open door" doctrine which carried with it recognition of China's sovereignty over her then existing territories, America stood before the world as China's disinterested champion, after she had secretly ceded her lands to Russia in order that the latter could wage a war of revenge upon Japan. Under the Hay doctrine, Japan could take no adequate steps to defend herself against this secret coalition. She allied herself with England and fought the war of 1904. Japan saved her independence at a cost of 200,000 men and national bankruptcy and owing to the profound secrecy surrounding the Sino-Russian treaty of alliance was swindled out of a cash indemnity at Portsmouth. Japan paid the price for China's perfidy, the heaviest sacrifice any nation had been called upon to pay up to that date. Had the existence of the Li-Lobanoff treaty revealed in 1922 at Washington been even suspected at Portsmouth, China would have had to pay in territory for her participation in bringing about the war. The Liaotung Peninsula and the whole of South Manchuria would have passed under Japan's sway. Oriental secret diplomacy precipitated one of the most disastrous wars of history and ranged the world on the side of China. She emerged from the conflict as the injured and innocent victim and at once commenced intrigueing to deprive Japan of the modest fruits of her victory.

In this she was aided, abetted, advised, supported and encouraged at all times by Americans, deluded into the belief that Japan was the aggressor. The ink had hardly dried on the Portsmouth treaty when E. H. Harriman, the most powerful railway manipulator of his day, initiated negotiations to acquire the South Manchuria line from Japan in order to realize his dreams of a round-the-world railway service. When this scheme fell through, the wheels of American diplomacy and finance were set in motion in order to create a situation which would compel Japan to sell out. Maintained in complete ignorance of the secret relations between China and Russia, the American government stood firmly behind Harriman with the American consul at Mukden as his personal instrument. The agreement for a huge American loan for Manchurian development was signed in order to forstall Japan in the exploitation of the province and later the concession for the Chinchow-Aigun Railway was obtained and employed as a lever to compel Japan to accede to the demands of Harriman and sell the South Manchuria line.

Russia was making prodigeous efforts to resume the conflict. The Amur Railway was built, the Siberian line double-tracked, the lands east of Baikal colonized and industries established so her armies would be independent of European Russia for their supplies in the next war. Count Witte tells us that the conflict was to be resumed in 1912. Yet into the very centre of this maelstrom of hate and strife came the Americans with their high ideals of equal opportunity, the open door, railway rights, financing privileges and other facilities for extending their trade and influence. It was all very commendable, very legitimate.

Russia annexed Mongolia in 1912, the final step towards the consummation of her well-laid plans to be revenged upon Japan, and at once started negotiations in Paris for the loans necessary to build strategic railways through this region and enable her armies to outflank Japan's position in South Manchuria. In self-defense Japan extracted from China the right to construct the Taonan-Jehol Railway, a purely strategic road that would act as her outer line of defense against the menace from the direction of Urga. This line conflicted with the American rights to the Chinchow-Aigun Railway and Americans could only see in Japan's manœuver a deliberate attempt to oust them from that region. At no time were Americans able to visualize the intense play that was going on before their eyes or realize that Japan was keeping step with every move made by Russia to resume the drawn battle postponed at Portsmouth.

Japan was fighting for her life. Americans were interested solely in an abstract principle. China and Russia were working together to encompass Japan's downfall and humiliate England. To this end Russia used her French ally and Belgian agent and by 1914 had cut China north to south and east to west with concessions for strategic railways. The Trans-Asian trunk line had its deep-water outlet at the mouth of the Yangtze opposite Woosung, with the Russian bear twiddling his fingers before his nose at the British lion on the opposite shore. All these Russo-Franco-Belgo lines were designed primarily for the Russia conquest of China and the invasion of India from the north-east. And again, with Japan facing extinction and Britain the loss of her most valued imperial possession, Americans could only visualize a violation of the "open door" principle, an interference with their right to equal trade opportunity. Not one American writer, statesman or diplomat had the faintest idea of what it was all about; if they did, they kept their own counsel.

Came the great war, and the twenty-one demands of Japan. In the light of China's railway intrigues and Russia's triumph in outwitting the Anglo-Japanese combination, it is easy enough at this time to justify these demands, especially if we hark back to pre-war diplomacy and employ the same logic and reasoning advanced by European governments of that day to vindicate their forward policies. China had surrendered her vital transportation possibilities to Russia and her allies. Russia was preparing to precipitate another war in order to accomplish what she failed to do in 1905. On the surface it looked as though Japan had taken an unfair advantage of China, but the whole picture will disclose that she acted along the same lines and for the identical reasons that the British penalized China in 1898 through a similar ultimatum. Whether she was justified or not will remain a matter for discussion. Historians of the future will determine the truth.

In the meantime, Japan strengthened herself in China by loans and other moves. She financed the Peking party in order that both countries might present a solid front against the encroachments of the Soviet. The other powers became alarmed. America invited France and England to join in the formation of a new international financial consortium for placing China on her feet. Underneath all the high flown phrases of diplomacy connected with the creation of this instrument, the great truth stands out that it was more concerned in circumscribing Japan's activities than in regenerating China. Japan's position on the Taonan-Jehol line was made a special object of attack. She was denied the right to defend herself against the menace from the direction of Urga, a right that all her allies had laid down in the Versailles treaty when their own safety was at stake. In this respect, the consortium perpetuated the mistaken American policy in Manchuria which at all times hampered Japan's right to protect herself against the preparations of Russia to renew the conflict.

It is needless to recapitulate the history of allied intervention, of Siberia or how America once more was placed squarely across the path of Japan in a quarrel that we had no direct interest in. Suffice to say that Japan eventually withdrew her troops and surrendered her advantages in order to conform to American opinion. Not only in Siberia, in Northern Manchuria, but in Central China and in Shantung did Japan recede, and after all this, the Chinese raised the question of the legality of the 1915 treaties and tried to oust her from the Liaotung Peninsula. Under the steady pressure of American diplomacy and public opinion Japan is once more back to where she was in 1914, with the possibility at any time of the Chinese Eastern Railway falling under control of the Soviet, bringing the soldiers of the red army to Changchun, grinning at the discomfited Japanese across the station platform. Japan has been divested of every advantage obtained as the result of tremendous sacrifices and of every gain she had the right to expect from her allies for her share in the great war. She is back to where she started in 1905 facing an uncertain future in Manchuria where not only her national existence but her economic future is at stake.

What is the situation in Manchuria to-day? Last year when the Japanese Oriental Development Company negotiated a $10,000,000 loan in New York, the American chamber of commerce at Harbin composed largely of American firms staffed with Russians, came out with a violent protest for fear the loan would be employed to injure American trade interests in that region. This, at a time when the Soviet had driven Americans out of Mongolia. There was no protest against the Russian move. When later, the South Manchuria Railway tried to negotiate a similar loan in New York the same protests were heard. This time they were more successful. The loan failed and Japan went to London and obtained the money from the British. Funny people, the British. When Japan first took over the South Manchuria Railway her British allies loaned the millions to rebuild and equip the line. The Japanese spent the money in America and did for Americans what they have never been able to do for themselves in China. They built and equipped an up-to-date American railway and in doing so provided the Chinese with an object lesson in American railroading that has brought from them many profitable orders for similar equipment for their own lines.

Now the S.M.R. has made Manchuria what it is to-day. Japanese money, Japanese brains, Japanese initiative and Japanese enterprise have transformed the most backward province of China into the most advanced and most prosperous. They have developed Dairen into the second port of China. What is most important to Americans is that since the South Manchuria Railway came into possession of Japan, over $75,000,000 gold has been expended in purchases of materials from the United States. America has never contributed one cent towards the development of Manchuria but has reaped the major trade benefits from the investments of others. European nations advanced over $150,000,000 gold to the Chinese government for railway construction in order to obtain orders for materials to the amount of $75,000,000. In other words, American manufacturers without advancing a cent have profited through the Japanese ownership of the S.M.R. to the same extent as though our bankers had financed all the loan built railways of China and from which they were excluded in the supply of materials! Yet in order to please a narrow-minded group of exporters and importers, Japan was refused a small loan for the further development of the S.M.R. which was advanced by the British. This after Americans had reaped all the fruits of previous British loans for the building and equipment of this line!

The South Manchuria Railway is not concerned with political expansion. It has a very definite place in Japan's scheme of defense, but its chief concern is to develop the resources of the country it serves. It is always doing things, big things. It sometimes makes mistakes. Other large enterprises do likewise. Look at its estimates of expenditures for the current year.

The budget for the new fiscal year is estimated at Y. 49,700,000, Y. 23,400,000 larger than the first revised estimates for the preceding year. Y. 12,000,000 for railway construction, etc., includes the building of a new station for Dairen, double-tracking of the main line north of Tiehling, and construction of locomotives and cars for carrying coal. The necessary alterations and installations for the Dairen wharves are included in Y. 3,500,000 for harbor improvement. The mining enterprise takes up Y. 3,300,000. For the Anzan Iron & Steel Works, Y. 8,000,000 is appropriated. It is part of the total outlay of Y. 11,084,400 for the extension work. Y. 3,200,000 is for improvement of electricity works; Y. 9,200,000 for the local administration, including education, hygiene, and public works; and Y. 5,000,000 for reserve fund. The estimated receipts are put at Y. 38,500,000 being an increase of Y. 12,000,000 for the preceding year. Among the fresh enterprises may be counted the increase of Fushun coal outputs from 4,900,000 tons to 5,500,000 tons, the increase of its exports to Japan from 500,000 tons to 1,000,000 tons; erection of new Yamato Hotel buildings at Mukden; construction of a new 3,600-ton steamer of the D.K.K. Shanghai line; and construction and expansion of a glass factory.

Here are $25,000,000 gold to be expended during the current year, for improvements and extensions, new plant and other activities that will provide a market for American manufacturers. The S.M.R. has found a way to work the low-grade iron ores of Anshan at a profit and will erect a 200,000-ton steel plant. They are now solving Japan's petroleum problem by extracting it from the oil-bearing shale of Fushun. Millions are to be expended to develop these new industries and most of the equipment will be purchased from American manufacturers. It means more business, more cargo for our ships, more trade for our merchants, more prosperity all around.

Let us look at another picture. In this number of The Far Eastern Review is found the report of Mr. Oustroumoff, manager of the Russian Chinese Eastern Railway. He tells us that the Chinese Eastern and the Ussuri Railway administrations have entered into a joint agreement to hand over their ocean freight business, to a well-known American shipping company. This is quite legitimate.

Further on in his report he mentions the plans of the railway management to concede special favors to all cargoes imported into Manchuria by the way of Vladivostok. This is not quite so legitimate, and if practiced by the Japanese S.M.R. line would be considered by some Americans in China as a cause for war. Now if we will recall the previous picture of how the application of Article 28 of the U. S. shipping act will affect the Japanese steamship interests, how American steamships will succeed to their business with the American trans-continental railways, and then turn our eyes towards the other side of the Pacific, we see an American steamship company having a similar arrangement with the two Russian railways terminating at Vladivostok, a combination that will give to Americans a monopoly of the trans-pacific carrying trade. Mr. Oustromoff's plan to grant special favors to cargo imported into China via Vladivostok will enable Americans, once the Japanese steamships are driven from the trade, to seriously menace the prosperity of the S.M.R. The special American railway freight rates enjoyed by goods imported and exported on American steamships added to similar special favors on the two railways serving Asiatic Russia and Northern Manchuria will enable whoever holds the through traffic agreement at both ends to monopolize the trade. This is not all. Add to these specially favorable conditions the specially favorable tariff imposed on goods imported or exported into China over the Russian border, or about one-third less than the tariff paid on similar imports and exports at Dairen, and we begin to have some idea of how Article 28 of the Jones act may strike at the most vital point in Japan's economic life.

In stating this case we do not wish to imply that the American steamship company referred to is seeking to take an unfair advantage of Japan through a deal which will give its cargoes preferential treatment over the rails of the Chinese Eastern Railway. The agreement between the Russian railways and the American steamship company, we understand, has not been signed. The fact, however, that Mr. Oustroumoff admits that it is a possibility is sufficient for our purpose. Neither are we criticizing the American company. It is entitled to every legitimate advantage it can obtain in the keen struggle for cargoes, and if the Russian lines elect to contract with an American steamship company to handle its through ocean freight on lines similar to the provisions of Article 28 of the Jones act, they are probably well within their right. They are not within their right, however, when in addition to the lower import and export tariffs imposed on goods crossing the Chinese-Russian frontier, they concede special railway tariffs or other favors to such cargoes that will seriously imperil the economic position of the South Manchuria Railway.

It may be accepted as an axiom that whatever American trade has been developed in Manchuria is traceable to the activities of the Japanese. The Russian-Chinese Eastern Railway up to a few years ago was employed solely to advance Russia's imperialistic designs in Eastern Asia and promote the trade and industries of Siberia. It is natural for the Russian line to seek every advantage over its Japanese rival, but there is no good reason why Americans should become a party to their schemes. If the Russian plans are carried out in conjunction with some American steamship company, it will operate unfairly to the injury of Japan.

All this throws into bold relief the long-drawn out intrigues on the part of Russia to cause bad blood between America and Japan. First, we had the Vanderlip concession in Siberia and Saghalien which violated Russia's treaties with Japan in regard to fishing and other rights. Then came the Sinclair oil concession in Saghalien-sops thrown out by the Soviet to influence American recognition and embroil us with Japan. This was especially true in the case of the Sinclair concession given at a time when northern Saghalien was occupied by a Japanese army as a pledge that Japan would be indemnified for the Nicolaievsk massacre. In fact, Americans at home were informed by a representative of the Sinclair interests that the United States would have to fight Japan over these matters. Curiously enough, this gentleman was also a sort of Chinese Pooh Bah, an adviser to the president and several *tuchuns*. It is a further strange coincidence that the representative of the Sinclair interests now in Moscow pushing the claims of his employers is also a highly paid foreign official of the Chinese government and adviser to the president. When we add to these open incitements to international discord the plan advanced by Mr. Oustroumoff that would use an American shipping company as the Russian instrument to deprive Japan of the legitimate fruits of her industry in Manchuria, we can better appreciate Japan's plea for a square deal from America.

If we are to close our doors to the Japanese, drive their shipping from the Pacific and then follow them up in Siberia and Manchuria and hamper their economic expansion in the one corner of the world where our policies have driven them, can we always expect them to view us as their friends ? Is there not some other place in China where American activities could be exerted in building up a trade sphere where their interests will predominate, without forcing ourselves into the corner where we have driven Japan to seek her future ? If Americans desire to exploit such a region where the profits will be greater than in Manchuria, we will point the way ?

* * *

Get Behind "Bill" Carey

Picture No. 5 : All Aboard for Szechuan !

An Outlet for American Capital and Energy in China

In the far-west of China lies an empire inhabitated by 60,000,000 hard-working people, a rich, prosperous, self-contained land whose only outlet to the world lies through the dangerous rapids of the Yangtsze Gorges. Here, in Szechuan innumerable opportunities await the investor, the miner, the engineer, the manufacturer and the merchant. Minerals of all kinds abound. A system of irrigation carries the melted snows of Tibet to the Chengtu basin, one of the richest agricultural regions of Asia .From these same mountains will come the hydro-electric power that will industrialize and convert the province into a great manufacturing center. It is the only place in China where such water power possibilities exist.

This wonderful country has long been the goal of railway enterprise in China. The British, the French, the Germans, the Belgians, the Russians and even Americans have laid awake nights scheming to gain the right from the Chinese government to open up this treasure-house through the construction of railways. The story of these railway intrigues forms one of the most interesting chapters in China's modern history. It is too long to relate here. Sufficient to say that Americans have had several opportunities to build these lines and failed to take advantage of them. It will surprise many to learn that the only railway right possessed by Americans in China arises from a promise given by Prince Ching in 1903, to minister Conger that in the event foreign capital became necessary to build the line into Szechuan, Americans and British would be given the preference. Aside from the original Canton-Hankow concession this was the only right we acquired, and used it in order to break into the Hukwang negotiations and be admitted on an equal footing with France, Britain and Germany. As a consequence of this somewhat vague and shadowy promise, the American Group now holds a quarter share in the Hukwang loan with the right to build the Ichang-Wanhsien section of the line to Chengtu.

In 1913, the representative of Dr. Sun Yat-sen offered the American Group a concession to build the Canton-Chengtu railway with its branches, constituting the southwestern trunk system of Dr. Sun's scheme. No financial advances were required. They were simply asked to sign a preliminary agreement, establish American rights and hold them in cold storage. It was rejected. Then came the Siems-Carey Company and after being shooed off the preserves of other powers, finally obtained the contract to build a railway from the Peking-Hankow zone to Chengtu. They carried out the surveys and when ready to start work the British protested. These protests carry no weight at present.

There is nothing to prevent American capital and enterprise from carrying out this important project. It is true that the Siems-Carey contract is pooled in the international consortium, but there is nothing to obstruct Americans from financing it themselves, if their other partners decline to participate. Such a job is one American engineers pride themselves on. An American railway into Szechuan carrying the produce of an empire to its ships at Hankow and freighting back the necessities of 60,000,000 people is one of the few big railway dreams yet to be realized. From this main artery of communication, branch lines, tramways and roads will radiate to the farthest corners of the province and in a decade or so a vast industrial state will be evolved that will overshadow in importance all other provinces of China. Factories and mills will follow the railway, electric light and power plants will line the banks

of the mountain rivers, mines will be opened and the minerals worked into finished products within the province. In this region American capital and enterprise can duplicate the work of Japan in Manchuria.

Here then lies the opportunity of America. "Westward the course of empire takes its way." Why "crab" everything that Japan has done or is trying to do in Manchuria. It is the only outlet she has for her energies. Co-operate with her in that region, or, if we want a sphere of our own to show what we can do, let us trek westwards towards the roof of the world and develop Szechuan. Here, Americans can put into practice and realize those dreams of Anglo-American co-operation in Asia about which we are now hearing so much. Szechuan borders on Tibet, that vast mysterious land rich in unexploited natural resources. The British have a treaty with China which prohibits the granting of Tibetan mining concessions to foreigners, but this was aimed solely at Russia. The British would be only too willing to carry out the American idea of co-operation and let down the bar for our capital and explorers.

Let us remember that outside of our $7,500,000 share in the Hukwang loan, Americans have contributed nothing towards the development of China's railways, or the trade these railways have made possible. American commerce with China has grown to its present proportions not because of any special effort on our part, but in spite of it.

If Americans would annually invest through loans to China the same amount to build the Szechuan railway and develop the resources of that province that the South Manchuria railway allocates for improvements and new enterprises, say $25,000,000, they would soon create a sphere that would bring trade returns far beyond their dreams.

True, the time is not propitious for lending millions to China or embarking on any ambitious development program. Not until a stable, unified gorvernment is functioning at Peking can the essential guarantees be forthcoming for such an undertaking. But this will come. In the meantime, Americans should pause and take stock of the situation, of their trade prospects and what the future holds out for them. They should devise their own plans for the development of China with American capital. It is good to have a definite program and fixed policy, even if it be only a commercial one. No real progress can be made by hanging on to the coat-tails of other nations waiting for them to advance the loans for railway and industrial undertakings and then invoking the open door doctrine and picking the agreements to pieces in order that our manufacturers may participate in the business created by others. This is not the true spirit of America. It is the way of the weakling and the parasite.

It is time Americans awoke from their trance and contributed towards the material development of a country from which they expect such wonderful trade returns. It is puerile to say that we are only interested in equal trade opportunity after more adventurous nations have made that trade possible through loans. It is equally nonsensical on our part to contribute $15,000,000 annually for the spiritual and educational uplift of a people and then refuse them a few millions for progress. The statement stands uncontradicted, that for every dollar the American merchant, manufacturer and trader takes out of China in profits, our philanthropists return two dollars for uplift work. We gladly spend millions to save the souls of the Chinese and elevate their moral and educational tone, but not one cent to better their economical status. Of all the impractical and foolish policies, the American attitude towards China challenges comparison.

Americans have still time to revise their ideas and get together for the formulation of some concrete program that will balance the labors of other nations in bringing material benefits to the Chinese and their own trade. The road to Szechuan is a long one. It will cost many millions, but once built will open a new empire to commerce. When the natural resources of Szechuan are tapped and the wheels of industry are working up its raw materials into manufactured products, when the mines are opened and the water power harnessed, Americans will be so occupied with new development projects that they will have no time to worry about what England is doing in South China or what Japan is doing in Manchuria. Their hands will be full.

Can it be done ? It can. Scrap all our other railway schemes and let American bankers, merchants, chambers of commerce and philanthropists combine with its government on a campaign to build the line to Szechuan. Get behind "Bill" Carey. Furnish the money. Start him shovelling dirt and before we know it the Chengtu Limited will be pulling out of the Hankow station to the cry of "All aboard for Szechuan ! It is a good American program. Let's go !

* * *

"Tommy Atkins" on the Roof of the World

Picture No. 6: The Eldorado of Asia

The Price of American Admission

SIGNS are not lacking that Central Asia will loom large in international politics during the next decade. The rivalries of Russia and England in Tibet and Turkestan, the impotence of China, the absence of communications and a general hostility on the part of the natives towards all foreigners have combined to maintain these regions a closed preserve. But the world is marching on. It needs raw materials, new mineral deposits, new oil fields and new outlets for its surplus capital and energies. The adventuresome white man will eventually locate these riches and stake them out for his own. Tibet, Western Szechuan, Chinese Turkestan, Mongolia and the Altais are more and more coming into the limelight, and with wireless telegraphy and aerial navigation the day is not far distant when these last frontiers will be crossed and their hidden Klondykes compelled to yield up their treasures.

The Germans have their eyes on the Altais. Their mining experts have reported favorably on the mineral deposits of this region, and Moscow has granted an extensive concession to the Stinnes interests. An American company with headquarters at Peking controls a vast gold mining concession which covers half of northern Mongolia. Out in far off Chinese Turkestan, the British have been investigating. They have a consul at Kashgar who keeps in touch politically and commercially. Last year the Marconi Company erected a wireless station at Kashgar. Major Dockray, the engineer, reports that the country is full of oil. The basin, he states, is thousands of miles in area, a continuation of the world-famous Baku oil fields. He asserts that Turkestan is the greatest potential oil golconda of the world ; the fields of Pennsylvania would be lost in one corner of the Turkestan field. Oil shale is found everywhere with visible evidences of vast deposits on all sides. Several plants are being operated by the Chinese on a small scale with crude machinery. Two plants are under the supervision of a noted Russian oil authority.

The only logical outlet for these fields at present is via Russia and this in turn is possible only after China recognizes the Soviet. Major Dockray is now in London interesting capital in developing these deposits, one of the biggest deals that modern finance can engage in. It is safe to say that if his reports are borne out, the British will find some way to corner this immense treasure and it is equally safe to say that America will not participate until the British have done the preliminary work when they will invoke the doctrine of equal opportunity. There is only one way for Americans to get into Central Asia and to do so we will once more have to get behind "Bill" Carey and back him morally, financially, diplomatically and in every other way while he builds the Mongolian railways originally contracted for by him with the Chinese government, and which Russia prohibited as soon as he had completed the surveys and was ready to start work. Some day the oil supply of the world will come from Central Asia and America should be willing to take a sporting chance in reaching the deposits.

Let us turn to Tibet. It is filled with gold. The districts between Lhasa and the Chinese frontier in what is known as Western Szechuan, are said to be exceptionally rich in the precious metal. The upper reaches of the Yangtsze are known to the natives as the river of Golden Sand. The mother lodes are located somewhere in the Forbidden Land. Tibet is a dependency of China, but in 1914, it came under nominal British protection, in fact, British influence at Lhasa is now paramount. There is a British postoffice in the capital of the Dalai Lama. Tibetan artillery officers are training with the Indian army. Modern arms are superseding obselete weapons. An arsenal is operating at Lhasa turning out Mauser rifles. A domestic postal service has been instituted, telephone and telegraph instruments are installed and a hydro-electric plant to light the capital has been contracted for. Youths have been sent to England for training as mining engineers, some of whom have returned and are out locating gold deposits.

Events are transpiring in the Forbidden Land and as usual the British authorities know exactly what is going on and keep their own counsel. It may well be that even the government at London is maintained in ignorance of just what the Indian authorities are doing.

A civil war is progressing, with the Dalai Lama backed by the British and the Tashi Lama a fugitive in Mongolia, under the protection of the Chinese where he is said to be organizing a force for the capture of Lhasa. Britain is closely watching developments. Her political agents in Kashgar and Western Szechuan and the Intelligence officers of her Indian army know every move made by Russia and China. They are watching the progress of the Germans in the Altais. Some day the British government will take its own steps for the proper protection of the northern and north-eastern frontiers of India and send another Younghusband expedition to the sacred capital of Buddhism. An end will then come to China's shadowy hold on Tibet. A British resident will sit beside the Dalai Lama, and Tibet will be opened to development. The Tibetans will go the way of the North American Indian. China may protest to the League of Nations or the Hague but paper invectives on the part of other powers will not stop Tommy Atkins from sitting on the roof of the world and collecting the price of admission. There is only one way for Americans to crawl under the ropes and get a free seat. An American railway into Szechuan will find us comfortably installed in the front row of the circus when the band begins to play.

* * *

The Perils of Mah Jong

MAH JONG sets figure prominently in the trade returns between Shanghai to the United States. The exports last year are valued at $1,505,000, or one-sixth of the total Shanghai exports to America. Just when the business is beginning to show a profitable return, the inevitable campaign against it as a new gambling vice is being initiated in America by returned missionaries. "The curse of China," one missionary characterizes the game and goes on to relate how the coolies gamble thir last cash, even their clothes and sampans ; therefore the game is disastrous to the morals of the people. Now the report is being circulated that mah jongg players in America are being poisoned, and the *Journal of the Association of Medicine* and the *Medical Times* officially recognizes the disease. The New York physician credited with discovering it last December says :

"It is nothing but ivy poisoning. The Japanese and other Orientals use poison ivy in making certain kinds of lacquer. When that lacquer is handled it may cause poisoning even if years or centuries have elapsed since the juice of the ivy was made into lacquer." A Japanese specialist, he adds, "tells of cases of ivy poisoning caused by contact with antiques to which lacquer had been applied 400 or 500 years before."

It appears, however, that the mah jongg players easily can protect themselves from danger of poisoning. The tiles themselves are said to be harmless. Only from contact with the lacquered containers are they likely to pick up "enough of the poisonous material to pass it on to persons who are very sensitive."

Some persons are reputed to be so sensitive to poison ivy that they become infected simply by the wind from it. May be the winds in mah jong should be abolished when sensitive persons are playing.

The danger from Ningpo varnish and the injury to the pocket when some gay player lays down a limit hand that runs into millions of points, together with the propaganda of the missionaries makes the game delightfully hazardous.

* * *

IN REMEMBRANCE

Richard Nettleton Goodwin

Late Managing Editor of "The Pinang Gazette"

A GOOD newspaperman has gone. Richard Nettleton Goodwin, managing editor of the *Pinang Gazette* has passed away in England. We knew Goodwin during the Spanish-American war days when he rendered a service which saved an American journalist from a Spanish military court, a blank wall and a firing squad and in doing so exposed himself to a similar fate, a story of Anglo-American good-fellowship that Goodwin was too modest to refer to.

A few weeks before the outbreak of the Spanish-American conflict the *New York Herald* requested *The Daily Gleaner* of Kingston, Jamaica, to send a man to Puerto Rico to act as its correspondent. This gentleman, a Mr. Halstead, overstepped the proprieties by photographing the fortifications and was promptly arrested and lodged in prison as a spy. The British government for some reason refused to help him and *The New York Herald* after printing the news dispatch concerning his arrest and incarceration lapsed into silence. Halstead remained in prison for the duration of the war, being released when the American flag was raised over San Juan.

Another member of *The Gleaner's* staff was sent to take Halstead's place. The new man was Goodwin. About ten days before the declaration of hostilities the correspondent of one of the big New York dailies blew into San Juan from Habana with orders from his chief to charter or purchase a steamer, yacht or tug-boat and get out and locate the Spanish fleet then somewhere in the Caribbean. The Spaniards soon divined what the correspondent wanted with a steamer, so the captain general issued a *bando* prohibiting the transfer of any vessel then in Puerto Rican waters and ordered that no clearance papers for a foreign port be issued to any vessel under 100 tons burden. The correspondent wired his office that there was nothing doing in the chartering line and the censorship was so strict that no news of interest was permitted to pass.

Somebody in that office was evidently peeved over the fact that *The Herald* had a man in jail as a spy and decided that it would make a great story if an American correspondent was arrested on the same charge. So this brilliant strategist telegraphed the correspondent in open English, "If other news impossible, send descriptions of fortifications or anything lively." He started something. Right there the Spanish secret police awoke from their siestas and gave that correspondent the liveliest experience of his young life.

The Spaniards had an old score to settle with that particular newspaper man. For over two years a price had been placed on his head in Cuba where he had crossed and recrossed the Spanish lines on many occasions with the secret police trying hard to get him. The chief of police of Habana warned his colleague in San Juan to keep an eye on him. The telegram from New York classified him as a spy and from the moment of its receipt his every move was shadowed. The entire secret service force was placed on the detail, changing men every few hours. Fortunately, the correspondent had a Puerto Rican friend, head of the independence junta, an American educated dentist by the name of Del Valle—afterward mayor of San Juan. Del Valle had his own sources of information and knew every move made by the police. He pointed out to the correspondent the different sleuths as they appeared on the job and together they hid in doorways and shops after turning a corner and laughed at the detectives as they came around in a hurry and asked passers-by if they had seen *el Americano*. One by one the various members of the secret service force reported at headquarters that the *Americano* had tricked them. Finally, the chief of police sent out his best man, a flashy coffee and cream colored gentleman whose connection with the police was known only to insiders. Del Valle spotted him. When cornered, he grew insulting. He followed the American into the hotel and up to his room. He there grew abusive, with the result that he landed on his head at the bottom of the stairs. He swore to be revenged.

Within the hour Del Valle came hurriedly into the hotel with the news that the *Americano* was to be arrested as a spy. The chief of police was furious. So was the captain-general. They decided to make an example of the correspondent but did not care to court publicity by an open arrest. Four men were detailed to watch the Hotel Ingles and nab him when he came out. The American was in Goodwin's room when Del Valle told his story verifying it by pointing out the window to the sleuths lounging around the door of the post-office across the way.

It was then eleven o'clock at night. Arrest as a spy with war only a few days away could have only one ending. The correspondent had no ambition to ornament a Spanish dungeon or be led blindfolded to the fosse of Morro Castle in order to gratify the

whims of a fool editor sitting comfortably in New York waiting to spring a sensational news story. The chances, however, were all in favor of his becoming a martyr to hectic journalism. It was impossible to escape by boat at that time of night even if one could be obtained. The nearest neutral island was 150 miles away. Escape into the country on a horse or in a carriage would afford only a temporary respite from capture. The city of San Juan is built on a small island with the highway into the country passing over a draw-bridge embellished at each end with a sentry-box. The only hope of immediate escape lay in crossing that bridge and reaching the east coast at Humacao by daybreak and there bribing some smuggler to land him at St. Thomas. The first thing, however, was to elude the vigilance of the sleuths outside the hotel, and cross the bridge without detection. It seemed a hopeless job. The American saw the doors of Morro Castle closing on him in the morning and was prepared to brazen it out.

At this point, Goodwin spoke up: "why it's easy enough. You can't escape by water. You can't use a horse or a carriage. You cannot walk far without being caught. There is only one way left. I have a new nickel-plated bicycle and have been riding around taking notes since my arrival. The main road leading out of town and across the bridge is down grade. Extinguish your lamp and pedal like hell. The night is dark and no-one can see or hear you. Once across the bridge the road is clear as far as Caguas. You can do that before morning. Leave the bike there and I will call for it some day when I have time." But, said Del Valle, "if it becomes known, the police will grab you and put you in jail with Halstead, if they don't do worse for aiding a spy to escape"

"I'll risk that," said Goodwin.

It was one chance in a thousand. The only chance. It was arranged that Del Valle and Goodwin should go out of the hotel by the main entrance, hold the police in conversation while the American sneaked down the servant's stairs and out through a side door used exclusively by tradesmen. If all went well, the three were to meet at the Plaza Colon under the statue of the grand admiral. The scheme worked. The police, thinking it was the American coming out, gathered around Del Valle and Goodwin and plied them with questions. Goodwin explained that he was going home with Del Valle and take a spin on his bike in the cool of the evening. It was all very regular and the detectives permitted them to proceed. In the meantime, the American slipped down the stairs and out through the side entrance without being seen.

The three met at the appointed rendezvous and as the clock in the cathedral chimed out the hour of midnight the American held out his hand and said good-bye to his friends. As he mounted, Goodwin slipped a .38 Smith & Wesson into his coat pocket, saying "you may need it, old top." The American disappeared into the darkness and remembering Goodwin's advice pedalled down the long grade past the barracks, past the prison and over the draw-bridge like a streak of greased lightning. Three times the startled Alto! Quien Vive! rang out as the dim shadow flew past but the rider was far away and lost in the darkness before the challenge was finished. He made the town of Caguas by daybreak and after a series of adventures with the Spanish authorities at Humacao, Vieques and Culebra was dumped out of a smuggler's boat at 3 a.m. on the beach of the Danish island of St. Thomas. In Vieques, the military became suspicious and the American had to slip out on the mail sloop for Culebra, where he paid a smuggler $200 to take him to St. Thomas. As the open boat crept out of the shadow of the land in full view of the lighthouse, its occupants could see the night heliograph flashing from the mainland and the answering signals from Vieques and Culebra. The smuggler developed a case of cold feet and started to head back for the cove. Arguments were of no avail. More gold failed to interest him. So the correspondent resorted to persuasion. For five hours he sat in the bow of the boat with Goodwin's thoughtful present silently keeping the smuggler headed on an eastward course. The Smith & Wesson carried the American over the last lap of a hazardous journey.

At St. Thomas the correspondent reported to his office as follows: "Arrived. Puerto Rico hot. After your fortification message, police surveillance. Eluded vigilance, midnight, bicycle, coach, horse, schooner, sloop, smuggler's boat, here." It was not the story they were expecting in New York. In fact, it was a disappointment. However, it stands as a classic of laconism in American journalism.

After waiting until nine o'clock in the morning for the American to come out of the hotel, the chief of police grew suspicious. He came personally to ascertain the cause of the delay in executing his orders. The sleuths on guard swore by all the saints in the calendar that the *Americano* had not left the hotel. Feeling that enough time had been wasted, the chief marched up the stairs to carry out the arrest in person. A knock on the American's door bringing no answer, the police entered to find the room empty. They then routed out Goodwin and applied the third degree. He knew nothing. He said he had gone home with Del Valle the night before and returned shortly after midnight. Every room and corner of the hotel was pried into. Then the whole force visited the harbor. No boats had left during the night. Not even a fishing smack had passed the lighthouse. All steamers and vessels were searched. The night resorts and other places which might shelter a stranger were inspected. The livery stable keepers testified that no coach or horse had been hired after ten p.m. The sentries on duty along the main road to the bridge swore that no one had passed them during the night. A house to house search followed, but after three days they gave it up. The chief of police reported to the captain-general that the American had simply disappeared. He was promptly discharged for incompetence and the military authorities took over the quest.

The American reached St. Thomas twenty-four hours after war had been declared with the heliograph flashing instructions to the coast guards and garrisons to shoot him on sight. It could never have been done without Goodwin and his bike or the Smith & Wesson he shoved into the American's pocket as a parting gift. Goodwin himself had a narrow call. A quarter century has passed and over the lapse of years the American acknowledges the debt and salutes his British comrade who has passed on.

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Hydro-Electric Project for the F.M.S.

ONE of the most important electric power developments in the Far East is the scheme for building a hydro-electric installation and dam across the Perak River near Batu Gajah in the Federated Malay States the plans for which are now being drawn up by the great British engineering firm of Armstrong, Whitworth & Company, Ltd. An abundant supply of hydro-electric power can be obtained from this river, and the extensive tin mines in the Kinta Valley in the district of Larut, together with the Federated Malay States railways would provide ample outlet for the power which could be generated.

The Perak River at Parit is within 8 miles of Batu Gajah, which is regarded as the centre of the Kinta mining fields. Surveys have been made of a dam site above Enggor, which is the most promising of all the localities considered. The transmission lines from this site would run close to good roads and railway lines, thus cheapening the cost of construction and maintenance.

If later on, further power should be required, other dams could be built across the same river higher up. The potential power available is estimated at about 20,000 kilowatts from the Perak River only, which is sufficient to take care of all anticipated needs.

Local engineers recommend that generation should be three-phase, 50 or 60 cycle alternating current, stepped up to 66,000 volts for transmission. Substations should be installed throughout the area of supply, where the pressure will be stepped down to 416 volts between phases, or to any other voltage that may be required by any large consumer. It is further recommended that outdoor substations be installed wherever practicable, both on account of a very marked saving in construction cost and to reduce the ill-effects of accidents or improper handling by indifferent labor.

It is too sanguine to assume that all the mines will change over to electric drive, though there is little doubt that in time more power will be installed in the mines. Generally, it may be assumed that in a few years a demand will arise for about 30,000,000 kilowatt hours per annum, rising later on to a considerably higher figure.

With the completion of the scheme of supplying hydro-electricity from the Perak River, not only will it be possible to supply every mine in Kinta and Larut with power, and every town in

Kinta with light, but it will also be possible to supply the new port at Prai. Indeed, with the coming of a really large hydro-electric installation on the banks of the Perak River, there should arise many electrifications besides that which will make the Kinta Valley one huge tin mine. It might mean that trams would be run between Ipoh and near-by townships, and the possible linking of Ipoh and Lumut by an electric railway, with the development of Lumut as a port.

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American Economic Interest in Tropical Asia

Last year the United States sold $49,691,877 worth of its products—largely manufactures—to India and Malaysia (including British India, Straits Settlements, and Dutch East Indies). The year before we sold $43,456,210 worth to these countries. In that same year, however, these countries bought approximately $728,-000,000 worth, principally of manufactured products, from Europe.

The things we sold them were chiefly manufactures in which we specialize for export, including automobiles, machinery, iron and steel products, hardware, electrical apparatus, machine tools, typewriters, etc. The demand for such products, however, only came after their demands for the necessities which Europe sold them had been satisfied.

Cotton goods constitute one-third of the normal imports of these countries year in and year out. We scarcely participate in this trade. Dyestuffs, for cotton goods locally manufactured in India, form an important demand from abroad. Generally speaking, we do not compete in this field. Chemicals form an important item of European sales, while we get only a small fraction of the trade. Great Britain sells India twice as many boots and shoes in normal years as we do.

Our product is as good as, and in many instances it is better than, the European. Our prices are too high, however, and we have not the requisite organization to sell the product on its quality. We simply permit it to be bought. If it will not sell itself we seek other markets.

In 1922 these countries sold $1,860,000,000 worth of their products to the world and bought $1,474,000,000 worth of goods. The trade of the Dutch East Indies and Straits Settlements was practically balanced between exports and imports. The trade of India, however, showed an excess of exports of $369,000,000. This came about by excess sales to the United States of $70,000,000, and to countries in the Far East, Latin America, and Africa of $378,000,000—a total of $458,000,000, which was reduced $89,-000,000 by excess purchases from Europe. This "favorable" merchandise balance of India's trade was liquidated in 1922 by net imports of gold and silver amounting to $382,000,000. This does not remain in circulation, but is melted down and hoarded by the people. By the modern alchemy of commerce, India is turning jute, tea, cotton, oilseeds, and other agricultural products into silver and gold.

The problem confronting those manufacturers who would sell more of our specialties to this region, therefore, is simply one of turning this precious metal into better roads, to encourage purchases of more automobiles; into factories making low-priced necessities, to encourage purchases of more machinery and machine tools; into railroads and buildings, to use more steel products; into electric power plants, to open markets for more electrical apparatus; and into greater literacy, to increase the demand for typewriters. Our whole economic policy in this region should be directed toward higher standards of living and the productive investment, instead of the hoarding, of wealth.—Frank R. Eldridge.

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The S.M.R. Solves Japan's Oil Problem

THE Japanese are always doing something worth while in Manchuria. After inventing a special reduction process that will solve the problem of working at a profit the low-grade iron ores of Anshan and drawing up plans for the erection of a new reduction plant and a 200,000-ton steel mill, they have turned their attention to the development of the shale deposits at Fushun from which an inexhaustible supply of petroleum can be obtained. The extraction of oil from shale has generally proved a failure as a commercial proposition, the only single exception being in Scotland. Here, according to the latest reports from England, there is considerable apprehension amongst the workers that the industry may be summarily closed down owing to the unsatisfactory financial position of the industry, as revealed in the report of Sir Charles Greenway, chairman of the Anglo-Persian Oil Company. The president of the board of trade, however, has assured the workers there is no immediate danger of the industry reaching a position where the question of closing down would arise.

The South Manchuria Railway Company has pinned its hope on the success of the Scotch industry and have carried out experiments in conjunction with the Japanese naval authorities which have proved quite satisfactory. From these experiments it is calculated that about 79,000,000 gallons of petroleum per year can be profitably extracted from 2,000 tons of shale per day. The oil shale at Fushun is found in the upper strata and at least two thousand tons per day have to be removed to get at the coal. In other words, the shale is obtainable practically free of mining cost, while the ammonia sulphate and the other by-products will help to make the enterprise profitable.

Mr. Kawamura, president of the South Manchuria Railway Company, is now in Japan conferring with the naval and finance authorities as to the best means of raising the capital required for installing the plant. It is estimated that some Y. 50,000,000 will be needed to cover equipment expenses over a period of three years. It is understood that in the conferences with the home authorities, the South Manchuria Railway Company has agreed to furnish the capital, and in the first year appropriate Y. 10,000,000. The company's budget for the new fiscal year is fixed at Y. 49,000,000, an increase of Y. 25,000,000 over the previous year. The plan having been approved by the home government, only the question of raising the capital remains to be solved. It is hoped that the imperial authorities will join in the enterprise and appropriate Y. 10,000,000 towards the cost of installation.

The Japanese navy uses about 500,000 tons of petroleum per year and steamship and other private enterprises, another 300,000 tons. It is pointed out that the home production of petroleum is small and with America restricting exportation, the Japanese navy and industries will soon face a serious shortage of fuel. It is estimated that the Fushun shale will supply the home requirements to the extent of at least 400,000 tons thus relieving the strain and assuring to Japan an oil supply that will place her in an independent position in case of emergency.

* * *

Chinese Machinery Market Contracted

By W. H. Rastall, Chief Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

Supplementing article "Competition for Machinery Trade of China," appearing in the March Number of "The Far Eastern Review."

THE Chinese machinery market, so far as the Shanghai business is concerned, contracted substantially in 1923 from the previous year, according to cabled information from Commercial Attaché Julian Arnold at Shanghai.

The value of all machinery imports into Shanghai amounted to 12,900,000 haikwan taels in 1923, as compared with 26,601,000 haikwan taels in 1922.

The figures for the various kinds of machinery imports follow:

The above figures show that during 1923 the imports of textile machinery into Shanghai decreased to about one-third of the value of the previous year; and that electrical and certain other classes of machinery declined to less than one-half the value of the 1922 imports. Propelling machinery and the miscellaneous groups, however, maintained, and even slightly increased, their volume.

Shanghai Percentage of Total Imports

In 1910, machinery imports through Shanghai were about one-sixth of the total imported into China; but since 1920 Shanghai has received more than one-half of the total, according to final figures of the Chinese customs. (The figure for Shanghai imports

in 1922 is different from that given in the preceding table, which was based on preliminary returns of the Chinese customs.) The figures for 1910-1922, inclusive, follow:

Machinery Imported into Shanghai.

Kinds.	1922 Haikwan taels.	1923 Haikwan taels.	1923 percentage of 1922 trade.
Textile	17,789,000	6,347,000	35.68
Electrical	2,899,000	1,223,000	42.19
Propelling ..	844,000	865,000	102.45
Miscellaneous ..	1,197,000	2,267,000	105.88
Other classes ..	3,872,000	2,198,000	56.76
Total ..	26,601,000	12,900,000	48.5

Industrial Machinery Imports into China.

Year.	Total imports into China. Haikwan taels.*	Total imports into Shanghai. Haikwan taels.*	Shanghai's percentage of total imports.
1910	10,886,065	1,814,906	16.67
1911	6,697,265	919,123	13.72
1912	4,558,988	1,037,805	22.76
1913	7,089,677	1,420,666	20.03
1914	8,253,968	3,886,942	47.00
1915	4,468,760	2,138,941	47.86
1916	5,970,263	2,141,966	35.87
1917	5,367,108	1,969,428	36.69
1918	7,415,071	2,693,380	36.32
1919	14,205,153	5,571,748	39.22
1920	22,038,508	11,774,586	53.43
1921	54,487,677	30,632,313	56.22
1922	49,602,045	27,644,033	55.73

If the above returns were expressed in dollars, the volumes would look very different, on account of the great fluctuations in the exchange rate of the haikwan tael.

Shanghai Imports by Countries of Origin

Over one-half of the machinery imported into Shanghai in 1923 came from Great Britain. Figures for the various countries of origin are as follows:

Shanghai Machinery Imports in 1923, by Countries of Origin.

Countries.	Haikwan taels.	Percentage of total trade.
Great Britain	6,549,000	50.7
United States	2,181,000	16.9
Japan	1,868,000	14.5
Germany	1,600,000	12.4
Other	702,000	—
Total	12,900,000	—

In the article published in the February 4 issue it was shown that for all of China in 1922 the British participation was 44.8 per cent.; the American, 23.3 per cent.; the German, 5 per cent.; and the Japanese, 18.3 per cent. The latest cable suggests that there has been a serious decrease in the volume of business secured by Japanese and American interests in China, while Great Britain, Germany, and certain other countries have increased their participation in this trade—all of which emphasizes the statement previously made that American manufacturers should give very serious attention to their decreasing participation in the machinery trade of China. Inasmuch as conditions in China are duplicated to a certain extent in other countries, manufacturers will also find it desirable to review their foreign sales policies.

*The par value of the Haikwan tael is $0.8255.

What the Earthquake Did to Japan's Railways

An Official Estimate of the Losses

THERE are over 8,450 miles of railway in Japan, of which about 6,500 miles are under government direction. The building program provides for an additional 6,000 miles, of which 900 miles are private projects. As a result of the severe economic strain on the financial resources of the empire arising from the disaster of last September it is doubtful if any material progress will be made in the immediate future in carrying out the above program, and the millions for new construction will be diverted to the repairing of damaged lines and the acquisition of new rolling stock to replace that destroyed by fire and quake.

The damage to the railways in the affected area varied from land slides and collapsed bridges and tunnels to the complete disappearance of every vestige of railway property.

The conflagrations in Tokyo, Yokohama, Yokosuka, Odawara, and Kamakura wiped out stations, trains, offices and warehouses. In fact, the Japanese government railways suffered heavily from the disaster; cracking, collapsing, and slipping of the lines and tunnels, destruction of railway bridges, derailment and overurning of trains, burning of rolling stock, stations, workshops, etc. The railway administration building in Tokyo was completely consumed by the flames, and the interference with the working of the transportation system thus caused extended more or less to the entire system of the government and private railways.

The Japanese government railways not only were unable to earn the expected revenue during the period but were obliged to expend about Y. 80,000,000 for the immediate repair of the damage. Private railway and tramway companies in the districts affected by the disaster were none of them exempt; their estimated loss amounting to about Y.25,500,000, and the expenditure for rehabilitation being estimated at about Y. 8,100,000.

DAMAGE TO LINES AND BUILDINGS.

A. Lines.

(a) Damage. In Tokyo and Yokohama a large number of sleepers were burnt, and the sections upon which damage was done are as follows, the entire length being estimated at about 420 miles:—

The Tokaido Main Line, Tokyo-Gotemba: The Yokosuka line, the Yokohama line, the Atami line, the freight line in the neighborhood of Yokohama and Hiratsuka, the Yamate line.

The Central Line: Tokyo-Kokubunji and Asakawa-Nirazaki.

The Northeastern Line: Ueno-Kawaguchimachi, Kuribashi-Kokawa, and the freight line to and in the Akibahara station.

The Joban Line: Nippori-Torite, Tabata-Sumidagawa, and Kitasenju-Sumidagawa.

The Sobu Main Line: Ryogokubashi-Kamedo and Funabashi-Naruto.

The Boso Line: Chiba-Oami.

The Hojo Line ; *The Kururi Line.*

The Narita Line: Narita-Shimousa-Matsuzaki and Fusa-Kohoku.

The greatest damage of all of the above occurred upon the Atami line, and the section between Hayakawa and Manazuru is not yet reopened for traffic. A considerable number of days were required for the resumption of traffic over the bridge across the River Banyu between Chigasaki and Hiratsuka, through Tunnels Nos. 3 and 4 between Yamakita-Suruga on the Tokaido main line and one between Yose and Uenohara on the central line, etc. etc.

DATE OF RESUMPTION OF TRAFFIC.

I. Sections and dates on which steam trains resumed service.

The Tokaido Line :

Tokyo—Shinagawa, Sept. 18 ; Rokugo, Sept. 4 ; Tsurumi, Sept. 5 ; Higashikanagawa, Sept. 6 ; Yokohama, Sept. 7 ; Ofuna, Sept. 8 ; Fujisawa, Sept. 11 ; Chigasaki, Sept. 12 ; Hiratsuka, Oct. 21 (connection on foot from Sept. 13) ; Oiso, Sept. 9 ; Ninomiya, Sept. 11 ; Kozu, Sept. 13 ; Yamakita, Sept. 21 ; Yaga, Oct., 28 (connection on foot from Sept. 21) ; Gotemba, Sept. 21.

Tsurumi—Takashima, Oct. 7 ; Higashi-Yokohama, Sept. 12 ; Yokohama-minato, Sept. 26 ; Higashi-Kanagawa, Sept. 12 ; Takashima, Sept. 12 ; Hodogaya, Oct. 3.

Kawasaki—Hama-Kawasaki, Oct. 17.

The Yokosuka Line :

Ofuna—Kamakura, Sept. 9 ; Zushi, Sept. 10 ; Taura, Sept. 13 ; Yokosuka, Oct. 1.

The Yokohama Line :

Higashi-Kanagawa—Haramachida, Sept. 28; Hachioji, Sept. 20.

The Atami Line :

Kozu—Odawara, Oct. 15 ; Hayakawa, Nov. 15 ; Manazuru, not yet reopened.

The Yamate Line :

Shinagawa—Tabata, Sept. 4 ; Ikebukuro—Akabane, Sept. 4 (withdrawn since Sept. 8).

The Central Line :

Tokyo—Manseibashi, Sept. 24 (withdrawn since Oct. 6); Iidamachi, Oct. 5 (withdrawn since Oct. 6) ; Shinjuku, Sept. 4 ; Hachioji, Sept. 4 ; Yose, Sept. 4 ; Uenohara, Oct. 25 (connection on foot from Sept. 7) ; Torisawa, Sept. 7 ; Enkyo, Sept. 5.

The Northeastern Main Line :

Ueno—Nippori, Sept. 22 ; Kawaguchimachi, Sept. 4.

The Joban Line :

Nippori—Kitasenju, Sept. 1.

The Sobu Main Line :

Ryogokubashi—Kinshicho, Oct. 8 ; Kamedo, Sept. 21 ; Inage, Sept. 1 ; Chiba, 2 ; Sakura, Sept. 1 ; Naruto, Sept. 3.

The Boso Line :

Soga—Toke, Sept. 16 ; Oami, Oct. 17.

The Hojo Line :

Soga—Goi, Sept. 1 ; Kisarazu, Sept. 4 ; Onuki, Sept. 6 ; Sanocho, Sept. 11 ; Kazusa-minato, Sept. 14 ; Hoda, Sept. 11 ; Iwai, Sept. 14 ; Tomiura, Sept. 28 (connection on foot from Oct. 14) ; Kokonoe, Sept. 23 ; Chikura, Oct. 16 (connection on foot from Oct. 16) ; Emi, Sept. 27.

The Kururi Line :

Kisarazu—Kururi, Sept. 24.

III. Sections and dates on which electric trains resumed service.

The Tokaido Line :

Tokyo—Kamata, Oct. 1 ; Yokohama, Oct. 21 ; Sakuragicho, Dec. 30.

The Yamate Line :

Shinagawa—Uguisudani, Sept. 16 ; Ueno, Ikebukuro, Sept. 23 ; Akabane, Sept. 21.

The Central Line :

Tokyo—Manseibashi, Oct. 7 (steam trains from Sept. 24 till Oct. 6) ; Iidamachi, Oct. 7 (steam trains from Oct. 5 till 6) ; Ushigome, Oct. 21 ; Kichijoji, Oct. 19 ; Kokubunji, Dec. 30.

B. Stations, Sheds, Offices, etc.

(*a*) Stations burnt down :—Yurakucho, Shimbashi, Hamamatsucho, Yokohama, Sakuragicho, Higashi-Yokohama, Yokohama-minato, Shiodome, Kanda, Maneibashi, Ochanomizu, Suidobashi, Iidamachi, Ueno, Akibahara, Sumidagawa, Ryogokubashi and Kinshicho.

(*b*) City offices burnt down :—Tokyo and Yokohama.

(*c*) Engine sheds burnt down :—Iidamachi, Ueno, Kinshicho and Tabata.

(*d*) Car Examination Sheds burnt down :—Ueno, Sumidagawa, Ryogokubashi, Shiodome and Iidamachi.

(*e*) Stations greatly damaged :—Kanagawa, Hodogaya, Totsuka, Ofuna, Fujisawa, Tsujido, Chigasaki, Hiratsuka, Oiso, Ninomiya, Kozu, Shimosoga, Matsuda, Yamakita, Konomiya, Odawara, Hayakawa, Nebukawa, Manazuru, Haramachida, Kozukue, Kamedo, Chiba, Susai, Sanukimachi, Iwai, Nakofunakata, Awa-Hojo, Kokonoe, Chikura, Minamimihara and Ushigome.

(*f*) Engine sheds greatly damaged :—Takashima, Yamakita and Awa-Hojo.

C. Railway Headquarters and other office buildings.

(*a*) Railway Headquarters building.

This was burnt down in the evening of September 1 together with attached buildings.

Upon the loss of this building, a temporary office was opened in the Tokyo divisional office building, which escaped from the catastrophe, and later a barrack covering about 500 tsubo was erected, in which office work was begun on October 11.

A new building was completed on November 23 at the former site and office work was commenced on that day.

(*b*) Other Office Buildings.

1st and 2nd Tokyo district improvement office and various other office buildings in Tokyo were burnt down on September 1, and temporary offices were set up in the Tokyo divisional office. On November 24 they were removed to the temporary buildings erected in front of the Tokyo station.

(*c*) Railway Works.

Railway works belonging to the headquarters of the department of railways burnt down :

Official bulletin printing house, clothing shop, and timber treating plant.

D. Official Residences.

(*a*) Official residences extending over 3,393 *tsubo* were burnt down.

(*b*) Official residences temporarily erected :

Shiodome, 82 ; Ueno, 20 ; Ishiwaracho, 18 ; Kinshicho, 16 ; Iidamachi, 34 ; Hiranuma, 44 ; Total area 2,584 *tsubo.*

3. Rolling stock and works damaged :

I. Rolling stock :

		Burnt	Damaged	Total
Engines	Tanks	17	9	26
	Tenders	31	51	82
	Total	48	60	108
Passenger Cars	Bogie cars	308	55	363
	Four-wheeled cars	116	7	123
	Total	424	62	486
Electric Cars ...	Motor cars	21	—	21
	Trailers	11	—	11
	Total	32	—	32
Freight Cars	Covered...	687	203	890
	Uncovered	284	94	378
	Coal cars	—	4	4
	Total	971	301	1,272
	Grand Total	1,475	423	1,898

II. Works :

Kinshicho Works, burnt ; Omiya and Oi Works, escaped destruction by fire, but damaged more or less. After repairs, the Omiya Works resumed work on September 7, and the Oi Works on September 8.

"The Future of Mankind May Some Day Depend Upon American-Japanese Friendship"

An Address by Ambassador Cyrus E. Woods Before the Pan-Pacific Club of Tokyo

"IN honoring me with this invitation to address you," said the ambassador, "I feel that you have given me a signal favor. For it seems to me particularly appropriate that it is at a meeting of the Pan-Pacific Club that I should have the pleasure of making my first public appearance on my return to Japan. I say that it is particularly fitting because the aims of the Pan-Pacific Union are at this time of special importance, embodying as they do the constructive aspirations of thinking men on both sides of the Pacific Ocean.

"The recent catastrophe itself, may in this regard, prove to have been a not unmixed evil. For the fortitude with which the Japanese people met such overwhelming disaster, the admirable spirit which this sorely tried nation has shown in the face of what must have seemed to many the almost impossible task of reconstruction, has not only filled the civilized world with admiration, but has also served to strengthen the old and also to forge the new bonds of friendship between Japan and the nations of the world. Of no nation is this truer than of the United States of America. During my recent visit home I was met on all sides with evidences of sincere friendship for Japan and a real desire to help her in her hour of need.

"I will, however, ask you, gentlemen, to take my word for this, as it is not upon this particular subject that I wish to dwell upon now. I have referred to the aspirations which animate the Pan-Pacific Union, which are friendship and co operation between all the peoples of the Pacific Ocean. It does not require any extraordinary acuteness to predict that the Pacific may well be one day the greatest theatre of the world's activities. The Mediterranean, which for centuries was the focus of Western civilization, lost its paramount importance upon the discovery of America and the consequent enormous development of the nations bordering upon the Atlantic Ocean. It incidentally might be contended that is is to the East that we owe the discovery of America, for was it not in their eagerness to find a short cut to India, Cathay and Cipangu that the early explorers hit upon the American mainland?

"For the next 400 years the Atlantic was to be the world's fulcrum. But signs are not wanting that the period of Atlantic preponderance is weakening, and that the Pacific is fairly on the way to take its place. With this imminent shifting of the balance of power, however, there came also heavy responsibilities. If the nations of the Pacific are indeed to become the arbiters of the world's destiny, they are morally bound to see that good use is made of their power. The period of Mediterranean and Atlantic preponderance has been marked by all the bloody wars of history.

Cyrus E. Woods, American Ambassador to the Court of the Mikado, with Mrs. Woods, calling to pay his Respects to the Prince Regent

"Will it not be possible for the era of Pacific preponderance—justifying its name—to be in truth pacific? In this new era Japan and the United States are destined to play leading rôles. Causes of friction between the two countries are happily fast disappearing and the factors making for good will are ever on the increase. The importance of commercial relations in this regard need hardly be dwelt upon, so obvious are they. The opportunities for augmenting the already great trade on the Pacific, to the benefit of all, are innumerable. But important as this commercial relation may be, and as a Yankee I do not underestimate it, it is in itself not enough to bind the two nations together. The late war was expensive proof of that.

"Besides commercial exchanges then, there must be a mutual exchange of ideas and ideals. In this sphere Japan is in an especially favored position. Is she not in a sense the clearing house between East and West? From the latter she has taken much that it had to give in the way of material achievement, but her ancient spirit she has kept intact. I look to a time when Japanese civilization may become a synthesis for all that is best in the Orient and the Occident, and Japan thus serving as a link between the two, interpreting the one to the other. Surely this is a prospect fine enough to fire the imagination and stir the ambition of the proudest people.

"There is but one plea that I should like to make, and that is that Japan, in adopting the material attainments of the West should go deeper than she sometimes appears to do and strive to understand something of the spirit which underlies these attainments. The accusation of materialism is, I know, often leveled at Western nations and more especially at America; but to take only the United States, the names of Washington and Lincoln, and much recent history besides, should dispose of such a charge.

"There is much too, that we on our side can gain from the age-old experience of Japan and the East, and a realization of these benefits will go far towards cementing lasting friendship between the two peoples. I think it is no exaggeration to say, in conclusion, that upon the friendship and co-operation between the United States and Japan the future of mankind may well some day depend."

Germany's Pre-War Foreign Investments

THE story of the way in which the German people by hard work, by economy, and by keen business acumen that took advantage of every change in the money markets of Europe managed to acquire by 1913 foreign investments valued at 5 billion dollars, only to see them melt away in the fires of war or sink in the slough of post-war days is only one of the interesting bits developed by H. G. Moulton and C. E. McGuire in the report of the institute of economics on the much-disputed question " Can Germany pay ?."

The story goes back thirty years, to 1893, when the Germans had already acquired about 3 billion dollars worth of foreign investments. For the twenty years (1894-1913) they added to this amount at the average annual rate of $100,000,000, but, during the next ten years, 1914-1923, they saw this accumulated 5 billion dollars worth of investments decrease almost to zero.

Before the war the Germans were heavy borrowers of short-term loans in the money markets of Amsterdam, London and Paris ; and undoubtedly they invested in long-term bonds in other countries most of the funds obtained in this way. These borrowings, though made for short terms, really ran for long ones. This was done, not by securing formal renewals from the first lenders, but by repaying the loans with money obtained from other lenders, many times from lenders in other cities. Naturally, in making this sort of " renewal," the borrower sought the market where money was cheapest. A German financial writer estimated in 1911 that these borrowings amounted to 125 to 150 million dollars a year ; and that nearly half of the amount was obtained for investment purposes rather than for financing mercantile operations. Undoubtedly they formed a considerable part of the $175,000,000 that were owed by the Germans to the British when the war broke out and that are still being paid through the clearing-house system set up for the purpose after the war.

Of the five billion dollars worth of investments owned by Germans in 1913, probably all the real property situated in enemy lands and part of the securities deposited therein were seized, the total value so seized by the allies amounting to nearly 3 billion dollars. Most of this property has now been or is being liquidated and the proceeds have been or will be returned to their owners or credited against Germany's reparation debt. Undoubtedly, these proceeds will, however, be much less than the value placed upon the investments by their owners, the total probable recovery being estimated at less than $400,000,000, a loss to Germans of 2½ billion dollars.

The investments which Germans had made in friendly or neutral countries suffered a different fate. Some of them were sold to the nationals of other countries, probably to those of countries which, like the United States, delayed their coming into the war. Most of the proceeds from these were used in one way or another to pay foreign obligations.

During the four years of the war Germany's total imports exceeded her exports by nearly 4 billion dollars. Most of these had to be paid for with gold, foreign money, bills of exchange, or some sort of foreign collateral, for outside of Germany paper marks early ceased to be acceptable. Foreign securities were about the only things available in considerable amounts.

In 1916 a government census of the foreign securities in Germany located over 4 billion dollars worth. The next March the government aoquired complete control over all these; and two months later began mobilizing them, particularly those representing property locyted in Sweden, Denmark and Switzerland, for through those countries came most of Germany's imports.

The entire 4 billion bollars worth locased by this census were disposed of af follows: Exported during the war 1½ billion; sold to purchase feed and raw materials, $200,000,000; depossted abroad and confiscated, 1 billion; reparation papments, $200,000,000; invested in securities of Germany's allies and ot present valueless, $900,000,000; exported since the war, $250,000,000. The last-named item plus whatever may be returned from the proceeds of seized properities constitnte all that remains of the 5 billion dollars' worth of Gorman pre-war investments.

The New Mitsui Bank

To be Built by American Constructors

THE construction firm of James Stewart & Co. of 30 Church Street, New York, has signed a contract with the Mitsui interests to construct the largest bank building in the Orient, the first important permanent building to be erected in Tokio since the earthquake of last September. The estimated cost is approximately 15,000,000 yen.

The building will be a concrete, stone and steel structure erected on the site of the old Mitsui Bank, and it is expected to set the standards for the best post-quake construction. Preliminary plans call for a building of five stories or more.

The contract was signed by Alexander M. Stewart, chairman of the board, on the part of the American interests.

The building itself will be 415-ft. long by 153-ft. wide and will have either five or six stories. Below ground will be an enormous system of safe deposit vaults. The building will be, according to present plans, the largest structure in the world used exclusively for a banking business. It will house both the Mitsui Bank and the Mitsui Trust Company. The structure will be built of steel and concrete throughout, with a heavy facing of native Japanese granite. It will face three streets, having sixteen enormous fluted Corinthian columns, 76-ft. high on the main front, and eight columns of the same dimensions on each side.

Trowbridge and Livingston of 527 Fifth avenue, New York, are the architects. They were represented in Japan by George W. Jacoby. Steel work will follow plans laid down by S. C. Weiskopf, an engineer, with offices at 11 East Forty-second street, New York.

The Mitsui Bank is one of the largest banking and commercial enterprise in the Orient. The business is more than 800 years old, and has descended from father to son since its foundation. The bank building in Tokio was destroyed during the earthquake.

It is estimated that about $3,000,000 would be spent in the United States for steel, cement and other building materials. Even machinery for quarrying the granite will be shipped from the United States.

* * *

Why American Steel Men are Friends of Japan

A STRIKING record was made in January in the volume of American steel exports, says the *New York Journal of Commerce*. At over 247,900 gross tons they were the heaviest in over three years, the previous largest volume having been in February, 1921. This expansion is further emphasized by the fact that the average steel exports in 1922 and 1923 were only 161,500 and 166,000 tons per month, respectively. The January shipments even exceeded the 1913 average of 242,200 tons per month.

More interesting still, however, is the cause of this sudden expansion. Buying by Japan late last year resulted in accumulated shipments in January in such a volume that over 94,900 tons was sent to Japan in that month, or over 38 per cent. of the total. In this particular instance, heavy reconstruction in Japan due to the earthquake has been the primary cause. In one item alone, black steel sheets, Japan in January took 93 per cent. of the total exports as well as over 83 per cent. of the wire nail shipments for that month.

While the January movement of American steel to Japan is phenomenal the importance of that country as a customer of American steel makers has been pronounced ever since the war. In 1920 over 30 per cent. of American steel exports went to Japan, and in 1923 over 18 per cent. Taking cumulatively the entire record for the five years since the war—1919 to 1923, inclusive—Japan is credited with the purchase of 27.5 per cent. of the total American steel exports for that period.

These facts are impressive evidence of the importance of Japan to America's foreign trade in steel. In fact, without Japan and Canada the American steel export trade would shrink to a volume less than that of even Belgium.

The Day of the Automatic Telephone

New Installations for Shanghai and Tokyo

THE automatic telephone is fast gaining favor throughout the Far East where linguistic difficulties constitute one of the hardest problems in providing efficient service for the public. The first complete automatic telephone system in this part of the world was successfully placed in operation in 1922 at Harbin by the Automatic Telephone Manufacturing Company, Ltd., of Liverpool. Following this came a small 500-line private exchange in Tokyo and then the 5,000-line system in Dairen installed by the same company. The earthquake and fire destroyed 16 out 20 of the telephone centrals in Tokyo and these are rebuilt with the automatic system. Now comes Shanghai with the initial steps towards automatizing its telephone service by the installation of the "Ericsson" system in the east exchange of the Shanghai Mutual Telephone Company, Ltd., which, if successful, will be ultimately extended to all other exchanges operated by this company.

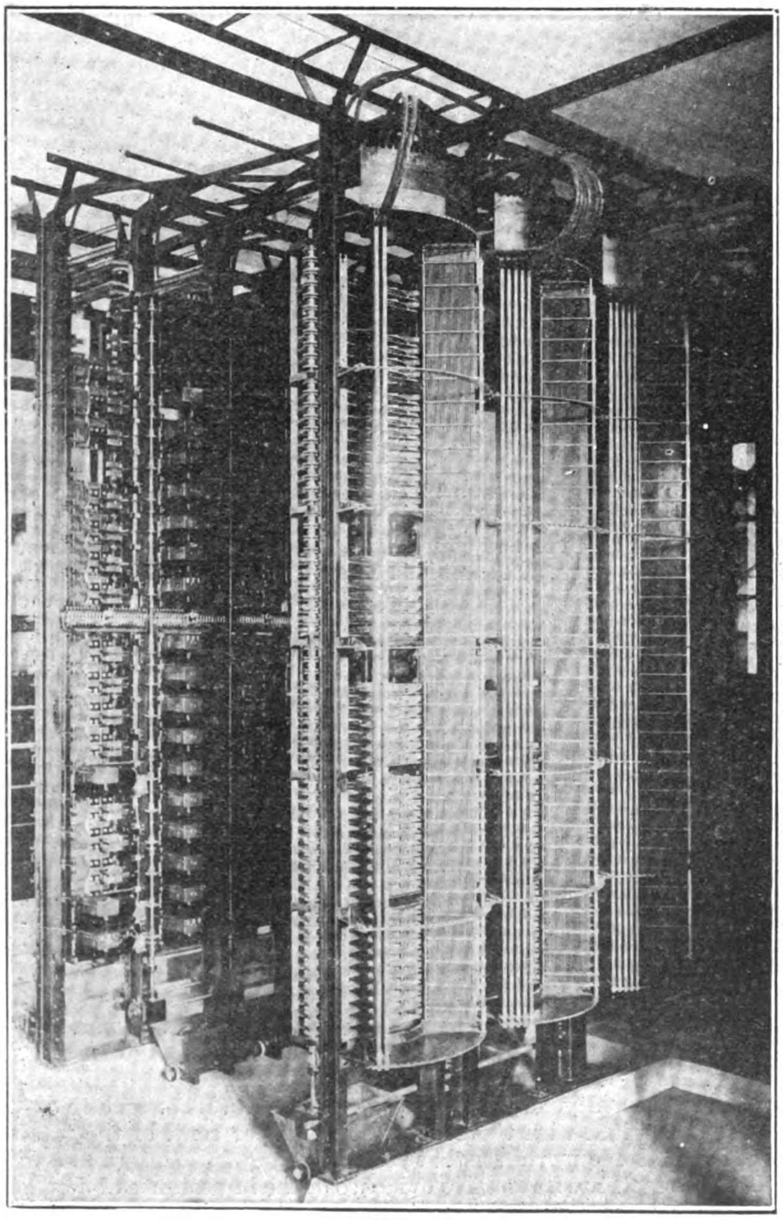
The Shanghai Exchange

The automatic system replaces the trained human element at the switchboard by a machine, the only operators being the subscribers at either end, the control of a call from start to finish entirely in their hands. No other public service depends so completely on the intelligent and sympathetic co-operation of the public. The telephone lines in a large city are divided into groups called exchanges. In Shanghai there are four such groups, viz., "Central," "West," "North" and "East." When the whole system is automatic these names will be replaced by numerals.

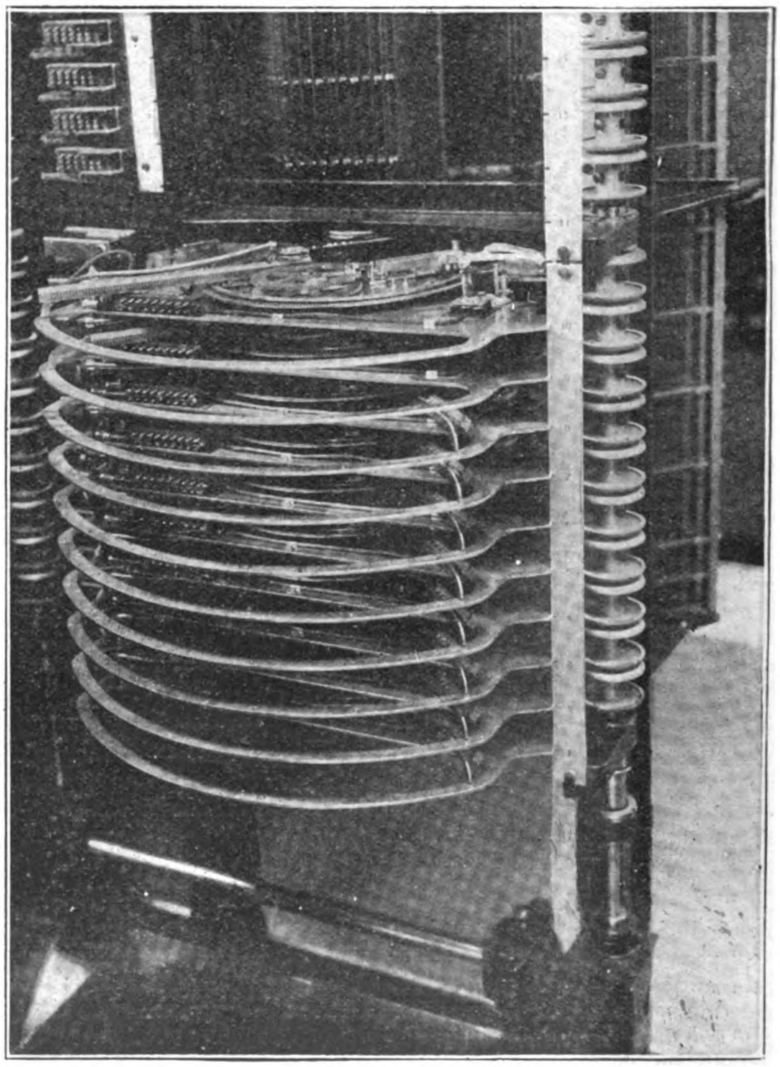
The automatic system now being installed provides for 50,000 telephones, 10,000 of which are allocated to each exchange area with the exception of central, which is allotted 20,000, so that assuming Shanghai will one day go wholly automatic, all

Central	numbers will be from	10,000	to 29,999
West	,, ,,	30,000	,, 39,999
North	,, ,,	40,000	,, 49,999
and East	,, are now	50,000	,, 59,999

The new exchange is situated in the company's premises at 6 Lay Road, Yangtszepoo, the whole of the equipment being installed in one large room which has been specially prepared for the purpose. This room has been made as far as possible, dust proof and damp proof. The telephone lines are led in from the street by cables and terminate on a protective device called an arrestor, for protection against lightning or electric light current contacts. From thence they are divided into groups, numbers 50001 to 50500 being connected to one set of machinery, 50501 to 51000 to another set of machinery, and so on, where they terminate on vertical brass

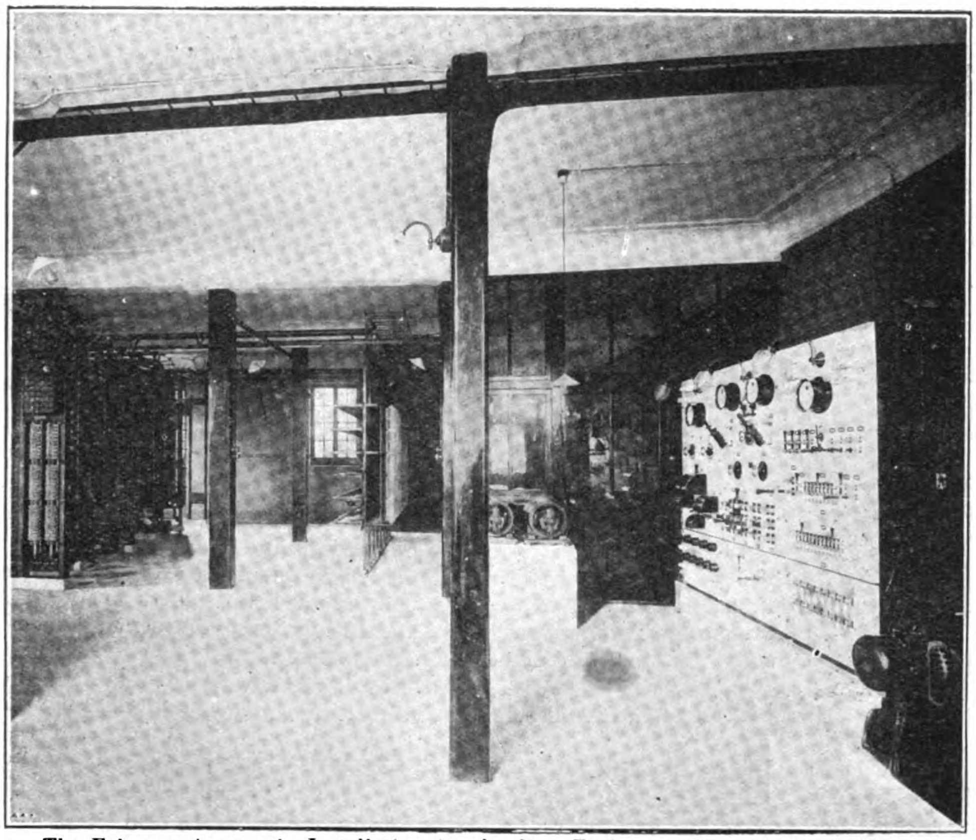


The Linefinder



Starting Distributor

THE ERICSSON APPARATUS INSTALLED IN THE EAST EXCHANGE OF THE SHANGHAI MUTUAL TELEPHONE CO, LTD.



The Ericsson Automatic Installation in the East Exchange of the Shanghai Mutual Telephone Company, Ltd.

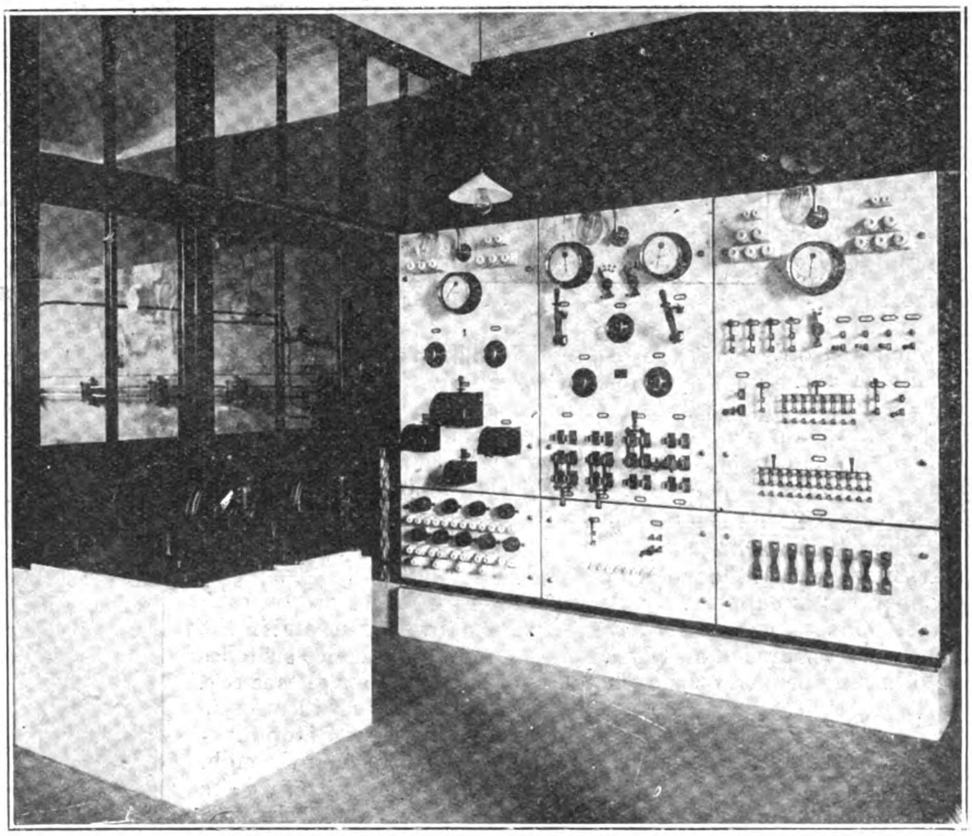
rods, the whole of each group being arranged in twenty-five groups of 20 telephones each. These brass rods are held rigid in a framework and these frameworks each containing twenty telephones are fitted fanwise on one side of an iron frame, which carries on its other side a series of brackets (50 of them) each of which supports a machine called a "Linefinder." This machine lookin appearance like a metal plate with a few wheels and electros magnets on it, and laying across its diameter a long narrow flat bar. This plate is capable of a radial movement and bringing the end of the flat bar opposite to each of the groups of wires on the opposite side of the frame, the bar by moving forward makes connection with any particular wire in the group to which it is opposite.

How It Works

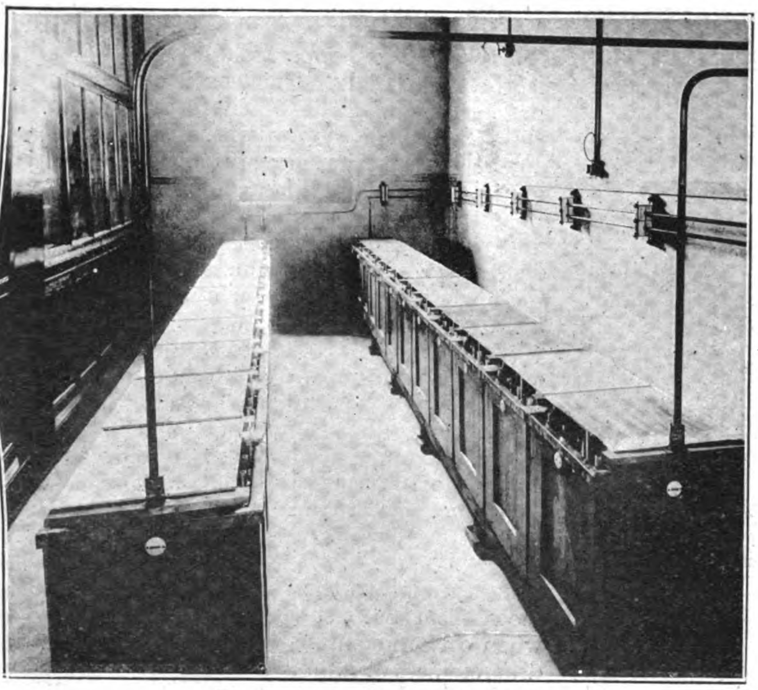
When a subscriber lifts his telephone off its cradle or support, a piece of mechanism called a "Starting Distributor" causes seven or eight of these "Linefinders" to start rotating before the frames containing the telephone wires until one of the "Linefinders" arrives opposite the particular group of 20 telephones in which the calling subscriber's line is situated. The rotation of all the "Linefinders" then ceases and the bar or plunger opposite the above-mentioned group immediately darts in amongst the wires and makes connection with the particular tele phone line that wants the exchange.

This operation connects the calling subscriber to another piece of mechanism called a register, which is the mechanical equivalent of human operator at an ordinary manual exchange. As soon as this machine is ready to take the call, which is practically instantaneously (unless the exchange is very, very busy and all the registers are engaged) a signal is sent back to the subscriber, who has been waiting (about 2 or 3 seconds) with the receiver to his ear. This signal is a continuous buzz or tone and takes the place of the manual operators "Number Please." The subscriber then starts to "Dial" his call. An automatic telephone is just like an ordinary telephone but has an additional piece of apparatus called a "Calling Device" or "Dial." This consists essentially of two discs, one fixed which forms a mounting plate by which the apparatus can be screwed down, and the other movable and provided with ten finger holes, each hole being labelled 1 to 0. In setting up the number 50499 for instance the finger is put in the hole labelled "5" and the disc is drawn round in a clockwise direction until the finger meets a stop which is attached to the fixed disc. The finger is then released and the movable disc will return to its original position of its own volition, and in so doing five electrical impulses will be sent back to the exchange. After the deal has come to rest the finger is put in the hole opposite the "0" and again released. This time 10 impulses will be sent back to the exchange. After the disc returns again, the same procedure is carried on with the figures "4," "9" and "9." As the different impulses come through to the register, various pieces of mechanism are set in relative positions, and when certain combinations are completed as the different sets of impulses are received, a piece of mechanism known as a "Group Selector" picks out a disengaged piece of apparatus known as a "Connector" which has access to the particular group of lines in which the "Wanted" subscriber is situated. This connector is similar in appearance to the "Linefinder" and has 500 telephone lines in front of it. As the impulses come through from the two final digits of the number required, the register causes the connector to rotate before the 25 frames holding the telephone wires and stops it when it comes opposite to the particular group of 20 in which the wanted telephone line is placed and then the bar or plunger darts in amongst the wires, and the register causes it to stop on the required number.

The work of the register is now completed and the "Linefinder" in connection with the "Calling Subscriber" is now joined through to the "Connector" which is in connection with

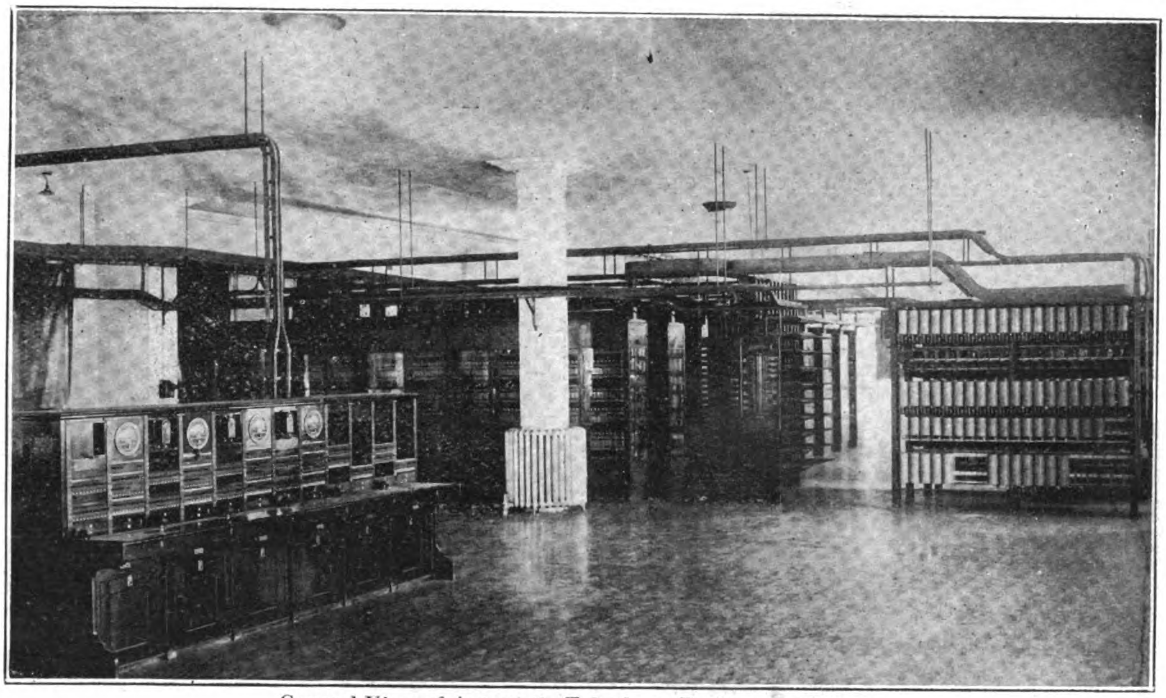


Switch Board and Motors in the East Exchange of the Shanghai Mutual Telephone Company, Ltd.



The Exchange Storage Battery

the "Wanted" subscriber. If the latter should be engaged a series of short buzzes or an "Interrupted tone" will be heard by the subscriber making the call and the receiver should be replaced on the rest. If on the other hand the line is disengaged an intermitted ringing current will be sent out to the wanted subscriber causing his bell to ring at short intervals until he answers. In order that the calling subscriber may know that he is through and that the people he is calling up are being rung, an intermittent signal will be heard in his receiver in the nature of a long buzz, then a period of silence, then another long buzz, and so on. After the conversation is over, the replacing of the receiver causes all the mechanism involved in setting up the call to be released and another call may be made immediately afterwards.



General View of Automatic Telephone Exchange at Dairen

The whole of the automatic plant occupies five different rack or frameworks and the motive power for moving the various pieces of apparatus is supplied by electric motors in duplicate on each frame. One motor obtains current from the town mains and in the event of this source of supply failing an automatic device switches the other motor on to the exchange battery. Various alarms and signalling devices have also been provided whereby notification is given to the attendant, should any part of the apparatus stop functioning, or should there be undue delay in a call going through. Provision is also made for assisting people in difficulties in cases for instance where a subscriber cannot or does not know how to dial. In such cases the calling subscriber is connected to an attendant who can plug into his line and complete the call for him.

Humidity plays an important part in the successful working of the plant and steps have been taken to regulate the moisture in the air automatically. When the humidity present reaches a certain percentage, electric heaters and fans are instantly set working and when the air is again at its correct degree of dryness the heaters and fans automatically stop.

The installation at the Shanghai east esxchange is supplied by Messrs. L. M. Ericsson & Company of Stockholm, and is the first system of its kind to be placed in operation outside of Europe.

Plans for Tokyo

Taking advantage of the destruction of old style telephone equipment in the earthquake, the Tokyo telephone bureau has announced that all of the telephone central offices destroyed in the September disaster will be replaced with automatic telephone equipment, says the *Japan Advertiesr*.

The present plans for restoration of the telephone system will not be completed until 1925.

"As a result of the September earthquake, 16 out of 20 telephone central offices in the city were destroyed, causing damage estimated at Y.150,000,000, Mr. Shimmyo said. "Many improvements must be made in the Tokyo telephone system, but the first and most important step the bureau has decided to adopt is an automatic telephone system for the new telephone central offices, some of which are already under construction.

"This system will eliminate considerable waste of labor for the bureau because numbers are obtained by shifting numerical figures on a dial attached to the telephone.

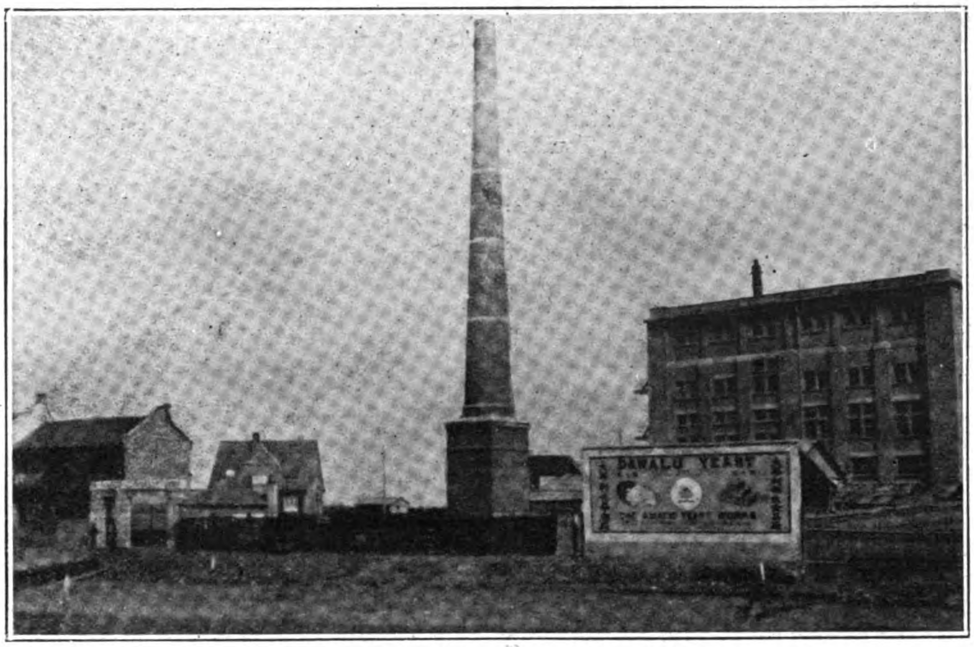
"Work of constructing six telephone central offices on the former sites where no land readjustment is necessary is under way and they are expected to be completed by September. The construction of the rest of the telephone centres will take place pending the completion of the land readjustment, and it is expected to be finished

(Continued on page 192)

One of the Tokyo Exchanges destroyed by Fire

Compressed Yeast Plant in Shanghai

A PLANT for the manufacture on a commercial scale has just been completed in Shanghai, on the borders of the settlement, capable of producing 1,500 kilograms a day of yeast. The plant, situated on the Soochow creek, opposite the Warren piece, is the only one of its kind in the Far East and its product is already being sold as far south as Singapore and as far north as Harbin. Cold storage facilities have been built into the plant to allow the manufacture and preservation of the yeast during the summer months.

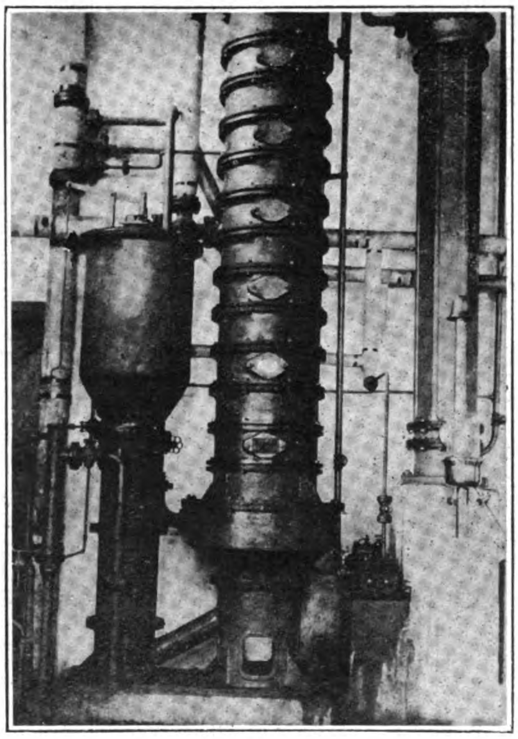


General view of the Asiatic Yeast Works

The plant is operated by the Asiatic Yeast Works, a filiale of the German Mee-Yee Trading Company of Shanghai. The machinery is all imported from Germany except certain simpler pieces which it has been found possible to turn out in China at lower cost. A steam-engine capable of developing 35 horse-power provides the necessary power and the two larger vats have a capacity of 50,000 and 35,000 liters respectively. The plant has its own electric light, also their own artesian-well, 304-ft. deep, from which a tested capacity of 20,000 gallons an hour can be pumped. The water is free from bacilli and has a temperature of 19 degrees centigrade.

The plant has a large boiler for the production of steam and heat. The building is four stories high, and 45 workmen are regularly employed, the majority being skilled men in various branches of the yeast-making process. The plant is in charge of a German chemist and bacteriologist, Mr. Hamann, who has superintended the construction and operation of similar plants in several countries of Europe.

Barley for the production of the yeast is first soaked in a tank of water until soft and thereafter laid out on the concrete floor of the maltery to grow from ten to twelve days, the temperature being very carefully watched, because when too low the barley stops growing, when rising too high the barley grows too fast. The maltery is maintained at an even temperature throughout the year by the use of an ammonia cooling system.



Machine for distillation of pure raw alcohol from waste liquid from the yeast solution

From the maltery the barley is taken and crushed between two heavy steel rolls until it consists of flat flakes much like Quaker oats. It is then dumped into the large oak-wood tank and mixed with water, making a malt solution.

In the meantime a special convertor has been cooking Indian corn to a thick paste, which is blown out of the convertor by steam at a pressure of 50 pounds into the oak tank with the malt solution. The diastase of the malt now changes the starch of the corn into sugar. When the solution has been sugarized, it is then fermented by the introduction of milk-acid bacteria into the same tank. After a certain acid percentage has been reached, the milk-acid germs are killed by raising the temperature of the solution to a certain point.

The solution is now pumped into another large tank for filtration. This tank has a special bronze bottom of very fine sieves, which hold back the solid matter remaining from the barley not in solution. This residue is then thoroughly washed out with hot water, and sold for foodstuffs for cattle.

The extract, in the meantime, runs into a big fermentation tank, where the yeast culture is introduced. The solution stands twelve hours. In order to stimulate the growth of the yeast, air is introduced through needle sprays and as it passes in bubbles to the top of the tank, gives the yeast cells the oxygen they need for rapid work. An even temperature is maintained the whole while by means of cold water coils in the tank, taking off the heat caused by the action of the yeast.

The fluid is now drawn off through a pipe, and after going through one more sieve control, falls into the centrifugal separators, of which there are four. These throw out the thick yeast and discard the liquid. The yeast now passes through another pipe to a press, composed of plates in parallel, capable of holding 200 kilograms of yeast at once. The plates squeeze out the last liquid and drop the compressed yeast, now dry, into special containers. The liquid is diverted back to a large tank from where it is distilled, producing a pure raw alcohol.

The yeast from the press is put into shaping and cutting machines, and formed into cakes and packages ready for sale or storage.

The room in which the final processes of separating, pressing, cutting and wrapping are done, is specially protected from the outside temperature. The floors are eight inches thick with cork and the outside walls have a layer of four inches of cork. The temperature of the room will be constant at 15 degrees centigrade throughout the year. A large system of overhead ammonia coolers is now in operation for this purpose.

A special laboratory equipped with the latest microscopes and other apparatus for the examination of cell life is on the second floor. Here the individual yeast cell best fitted for the reproduction of healthy strong cells is picked out by means of microscope and slide, from thousands of its fellows. Having been thus selected, it is put into an incubator and its progeny are put into culture apparatus and increase in quantity until sufficient cells have been produced for use in the big vat.

Chinese Wood Oil*

Production, Properties and Uses

By "Omega"

CHINESE wood or tung oil is obtained by crushing the seeds of *Aleurites cordata* or *Elaeococca vernicia*. At Fokien the seeds of *Aleurites Dordii* (Heussh) are used, the oil obtained from these seeds differing but slightly from that obtained from *Aleurites cordata* (see Kamelaka, *J. Coll. Science Imp. Univ. Tokyo*, 1908, and Lewkowitsch, Vol. 2, 0. 82). The tree is widely distributed throughout South, Central, and West China, in Indo-China, Tonkin, Cambodja, and Annam. The seed is one of the most important native products of China, and the oil forms the second largest in quantity of all commodities exported from Hankow.

The best quality oil is produced in the Chinese provinces of Szechuan, Kweichow, Huanan, and Hupei, the U.S. department of commerce report from the consul-general at Hankow stating that 30 per cent. of the total oil exported is manufactured in Szechuan 50 per cent. in Huanan and Kweichow, and 20 per cent. at Hupei. The oil content of methods now in use only about 40 per cent. is recovered. The agricultural and forestry boards of the southwestern states of America have attempted to cultivate the Chinese wood tree in California under semi-arid conditions, but up to date the quality of the oil obtained has not equalled the Chinese variety. Some progress has been made with the pressing of the Chinese wood seeds at Madagascar, where the oil is known as "bakoby oil."

Methods of Production

Chinese wood oil is marketed in various qualities, varying in color from light yellow to dark brown, and usually graded according to color, the district of production, and the methods used in expressing. The quality of the oil is largely dependent on the botanical and geographical origin of the seed, climatic conditions, conditions of storage, and the general treatment of the oil during its production. It often appears commercially under the name of wood oil, and hence the confusion with gurjum balsam, also known commercially as wood oil. The major portion of the oil produced is expressed by crude native methods in the interior, and shipped to Hankow. The seeds are dried over open fires, and then coarsely ground between mill-stones driven by oxen. The oil is extracted by pressing in crude wooden presses. The high-grade white Chinese wood oil is obtained by cold expression; the darker and cheaper varieties are obtained by further pressing the heated seeds. The cold-pressed oil is known in some markets as white tung oil, and the hot-pressed as black tung oil.

The residual seed-cake is not suitable for cattle-feeding purposes, but is used as a fuel and as a fertiliser. The production of the oil appears to be distributed over a large number of small individual makers, usually consisting of families, who bring the oil into the large towns, where it is bought by foreign merchants, who clarify the oil by settling before shipping. Apart from a process of sedimentation and filtration, but little refining of the oil is conducted.

American Specification for the Crude Oil

The standard specifications for raw Chinese wood oil adopted by the U. S. paint manufacturer's association is as follows:—Raw tung oil shall answer to the following requirements: Sp. gr., 15.5° C., 0.943—0.939; acid value, 6 (max.) saponif. value, 195—190; unsaponif. matter, 0.75 per cent. (max.); $n_D{}^{25} = 1.520—1.515$; iodine value (Hübl 8 hours), 165 (min.); and heating test, 12 mins. (max.). The following modification of Browne's heating test is prescribed: Test tubes for the oil should be 15cm. by 16 mm., and be closed by a cork through which a glass rod 3 mm. in diameter can move easily. A beaker (800 cc.), 15 cm. high and 10 cm. in diameter, is filled to 7.5 cm. with cottonseed or soya bean oil, and in this is suspended a thermometer at 1.5 cm. from the bottom. The oil is heated, and at 293° C. (560° F.) two test-tubes containing respectively 5 cc. of the tung oil and 5 cc. of a control sample are introduced, so that the bottom of each tube is level with the lowest part of the thermometer bulb. The source of heat is removed for about 45 secs. and then replaced, and the temperature maintained at 282° C. (540° F.) as constantly as possible. After 9 mins. the glass rods are raised at intervals of ¼ min., and a note taken of time required for each sample to set firmly. The average time of setting of pure American pressed tung oil was 9¼ mins., whilst the same oil with 5 per cent. of soya bean oil required 10⅜ mins. to set.

Properties of Chinese Wood Oil

Chinese wood oil is a pale yellow to brown oil, of a pronounced and persistent odor, high dispersion value, and dries more rapidly than any other fatty oil (*Pharm.* Jour./3, xv., p. 637). With the exception of castor oil, with which it is not easily confused, Chinese wood oil has the highest specific gravity and refractive index of the fatty oils. Its characteristic odor appears to develop on storage, newly pressed oil possessing a highly pleasant odor. The constants of the oil are as follows:

Specific gravity at 15° C.	0.9360—0.9440
Solidifying point	2° —3° C.
Saponification value	189° —196° C.
Iodine value	150 —170
Heat of bromination	24° —25.5° C.
Refractive index at 20° C.	1.5110—1.5210
Butyro refractometer value at 40° C.	72.5°
Valenta value (acetic)	38.3°
" " (true)	46.5°
Dispersion power at 40° C.	0.0371
Acid value	7.6 —12.0
Optical activity	Inactive
Viscosity at 15.5° C.	1850 seconds
CONSTANTS OF FATTY ACIDS.	
Solidifying point	31.2° C.
Titre test	37.1° C.
Melting point	40° —44° C.
Neutralisation value	189
Iodine value	145 —160

Gelatinisation and the Effects of Heating

On continued storage Chinese wood oil becomes gelatinised. Morrell (*J.C.S.*, 1912, p. 2,083) found that twelve months' storage converted 6 per cent. of the oil into a crystalline isomeride. It has been found by various observers that solvent-extracted oil does not polymerisê as easily as expressed oil. The property of Chinese wood oil of coagulation on heating has been the subject of considerable investigation, and various patents have been granted for introducing catalytic agents to raise the temperature of coagulation. Beringer (*Ger. Pat.* No. 261,403, 1912) suggests the addition of sulphides or selenides. Weinschenk (*Ger. Pat.* No. 253,845) introduces 1 part in 10,000 of zinc dust at 90° C. Traces of iodine sulphur chloride, or dimethyl sulphate have been found to promote gelatinisation. The coagulation of Chinese wood oil on heating limits its use in several industries.

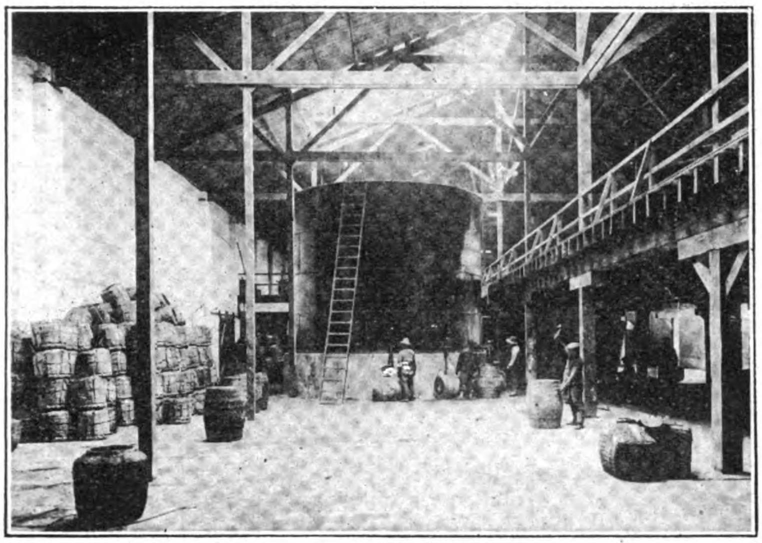
The effect on the properties of Chinese wood oil on heating have been studied by Morrell (*J.S.C.I.*, 1915, p. 1907), with the following results:—

	Raw Oil.	Thickened Oil.
Specific gravity at 15° C.	0.9405	0.9561
Refractive index	1.5172	1.5134
Molecular weight in benzine	797	1431
Acidity	3.3	2.3
Saponification value	192/194	190/201
Iodine value	165/168	143/171
Glyceryl (per cent.)	10.47	8.3

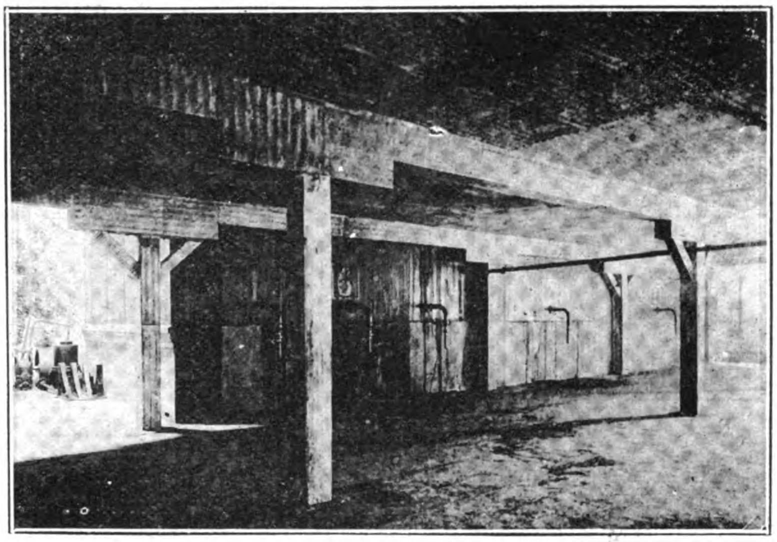
*The "Chemical Trade Journal and Chemical Engineer."

ONE OF THE LARGEST WOOD OIL INSTALLATIONS IN CHINA

JARDINE, MATHESON & COMPANY'S PLANT AT HANKOW



One of the Oil Storage Tanks.



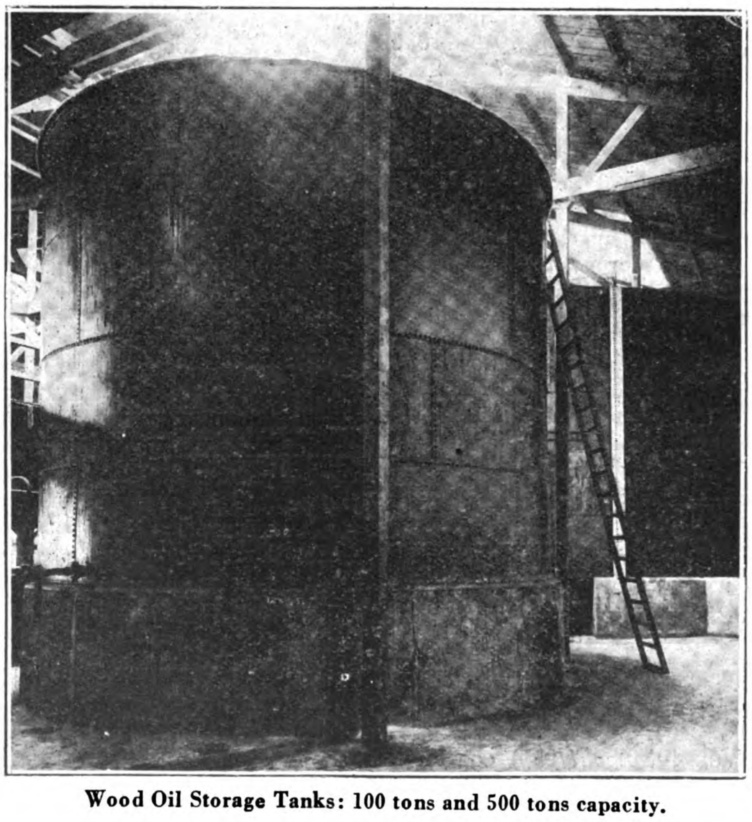
Front of Steaming Tanks: 100 tons capacity.

The gelatinous mass produced on heating the oil is not a homogeneous product, only a small proportion of the oil being changed. The unchanged oil can be extracted by solvents. Wolff (*Farden. Zeit.*, 1913, Vol. 18, p. 1170/1174) states that the jelly mass forms a colloidal solution with the unchanged oil, the setting of the mass being brought about by the gelatinisation of the whole. A small quantity of the stiff mass has been found capable of gelatinising large quantities of hot oil very quickly. Stevens and Armitage, Irvington, N. J., U.S.A., have recently published a most extensive bibliography of the technical and patent matter connected with Chinese wood oil, some 800 publications, together with 200 patents, being mentioned.

Composition of Chinese Wood Oil

The principal components of Chinese wood oil are the glycerides of elaeomargaric, and, to a lesser extent, oleic acid. The former is a stereo-isomeride of linolic acid. This mixture of glycerides appears to be a medium peculiarly suitable for the promotion of rancidity, and rancidity when once initiated proceeds rapidly up to about 6 per cent. free fatty acids. Chinese wood oil contains practically no saturated glycerides. Divers (*J.S.C.I.*, 1913, p. 23) found that the Chinese wood oil seed contains a cyanogenetic glucoside and an enzyme which lose their acivity on heating.

The characteristic coagulating properties of the oil have been studied by Fahrion (*Chem. Zeit.*, 1912, Vol. 2, 2,153/2,157), who found that the coagulation took place in two ways—(1) by molecular transformation, (2) by mesomorphous polymerisation. The glycerides and the fatty acids contained in Chinese wood oil are easily acted upon by light, with the production of isomeric compounds of higher melting point (Bauer, *Chem. Umschau*, 1922, Vol. 29, p. 229/232). Morrell states that prior to polymerisation there is a transferring of the linkages in the molecule and some slight evidence of ring formation.



Wood Oil Storage Tanks: 100 tons and 500 tons capacity.

Fokin (*Jour. Russ. Phys. Chem. Soc.*, 1913, Vol. 45, 0. 283/285) explains the increased refraction and transformation of the elæomargaric acid by actinic rays into a higher melting-point product by assuming the presence of either conjugated double likages or, as in allene, a double-linked carbon atom. Marcussion (*Zeit. Oel u. Fett. Ind.*, 1923, Vol. 43, p. 163/164) found that on ether extracting gelatinised Chinese wood oil 88 per cent. was soluble in acetone and 12 per cent. insoluble.

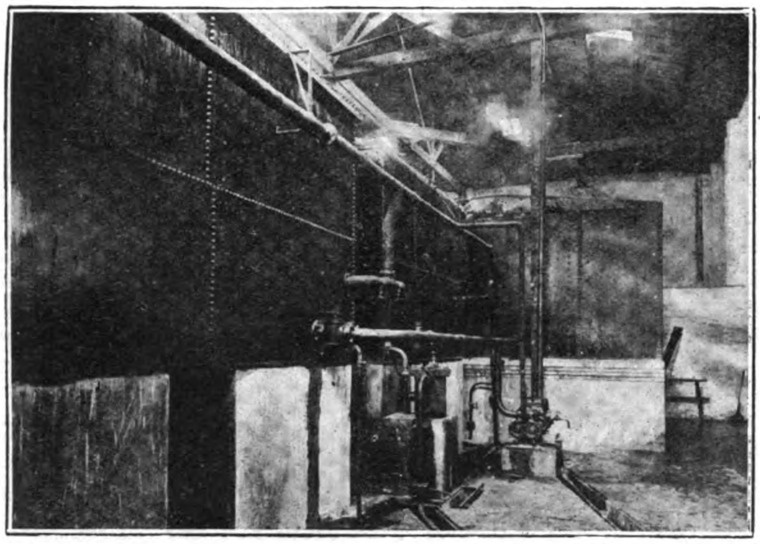
Growth and Extent of the Industry

Statistics regarding the extent of the Chinese wood oil industry are not available for England, as the board of trade returns include Chinese wood oil under the item "Various Vegetable Oils." The U.S. commerce report for February 9, 1921, p. 815, states that considerable quantities of the oil are used within China for "caulking" boats, and as a wood varnish and preservative. The total amount and value of the oil exported from the whole of China to foreign countries for the years 1912 to 1919 are as follows:

	Weight in Tons.	Value in Dollars.
1912 ..	34,691	4,309,174
1913 ..	37,598	2,967,111
1914 ..	26,164	2,509,297
1915 ..	18,473	1,843,554
1916 ..	35,665	4,565,108
1917 ..	23,898	4,932,626
1918 ..	29,598	7,129,280
1919 ..	36,516	10,816,955

Under war conditions the demand for Chinese wood oil increased to an enormous extent. Shipments for 1922 were the largest on record, amounting to a value of 10,888,130 Haikwan taels, compared with 5,466,430 in 1921. The market price of the oil appears to determine to a considerable extent the amount produced and imported in any season. The following were the market prices (dollars per picul—$133\frac{1}{3}$-lb.) at various periods:—

January,	1910 ..	5.33
,,	1911 ..	9.30
,,	1910 ..	18.58
October,	1920 ..	15.48
April,	1923 ..	17.30
January,	1924 ..	23.00



Back of Steaming Tanks: Duplex Pumps for filling Storage Tanks.

Rivetting and Flaring Hoops: Driving Hoops on Casks.

The American consul at Hankow states, in his report for 1921, that large quantities of Chinese wood oil are held for speculation purposes by dealers in the interior Chinese markets, and that over 60 per cent. of the exported oil from Hankow comes from the Szechuan or Kweichow district, the oil having to be brought in junks through the treacherous Yangtze gorges. Prohibitive insurance rates exist for bringing cargoes of Chinese wood oil from Szechuan to Hankow.

Adulteration and Identification of Chinese Wood Oil

The high prices ruling of late years have occasionally tended to introduce adulterants or diluents into the genuine oil. The common oils found as adulterants are soya, cotton-seed, sesame, and stillingia. The highly characteristic odour, specific gravity and refractive index of Chinese wood oil make adulteration only possible up to a limited amount. Lewkowitsch (Vol. 2, p. 79) states that sesame oil is detected by the Baudouin test, and stillingia oil by the optical activity. However, the most important tests to be applied to a suspected sample of Chinese wood oil are the gelatinisation test, specific gravity, refractive index, dispersion value, iodine value, and the viscosity. Chapman (*Analyst*, 1912, Vol. 37, p. 543/549) examined 17 samples of the oil obtained from Hankow (and known to be genuine), with the following results :—

	Sp. Gr. 15/15° C.	Iodine Value (Wij's).	Sap. Value.	Refrac. Index at 20° C.	Viscosity.
Minimum ..	0.9406	166.4	192.0	1.5170	1636
Maximum ..	0.9440	176.2	196.6	1.5207	2178
Average ..	0.9425	170.6	194.2	1.5179	1850

McIlhiney proposes a method for the determination of the amount of Chinese wood oil in mixtures by gelatinising the former with iodine in chloroform or acetic acid, and separating the insoluble matter with petroleum. Schumann (*Proc. Amer. Soc. for Testing Materials*, 1914) proposes to estimate adulterants such as sesame and soya oil by gelatinising the oil with a trace of sulphur chloride aided by the action of light, an isomeric glyceride being formed which is insoluble in petroleum ether. The U. S. *Commerce Reports* of February 9, 1921, p. 813, states that merchants avoid some adulteration by applying so-called "secret" tests to determine the purity of the oil. Drying tests easily differentiate Chinese wood oil from linseed oil, the former drying much more rapidly giving an opaque no-elastic film, in contrast with the transparent elastic linseed film. Boughton gives the following results of drying tests of the two oils in the presence of litharge :—

	Hours Exposed.	Increase in Weight. Per Cent.
Chinese wood oil	48	0.9—5.9
,, ,, ...	96	3.6—8.7
Linseed oil	48	12.9
,, ...	96	13.7

Tests Adopted by the New York Produce Exchange

Krumbhaar (*Chem. Zeit.*, 1916, Vol. 40, 0. 937/939) considers that the most marked difference between Chinse wood oil and linseed oil is the rate of polymerisation. The chemists of the New York produce exchange detect any adulteration by applying a stringent gelatinisation test, more importance being attached to the hardness of the gelatinisation product than to the time of gelatinisation. The oil is required to satisfy either of the following tests :—

Bacon's Test.—In four test tubes of $\frac{3}{4}$-in. by 4-in. are placed : (1) 10 cc. of pure Chinese wood oil ; (2) 10 cc. of the same oil containing 5 per cent. of a vegetable oil ; (3) 10 cc. of the Chinese wood oil containing 10 per cent. ; (4) 10 cc. of the sample to be tested. The four tubes are immersed in an oil bath at 288° C. The tubes are maintained at a temperature of 280—285° C. for 9-mins., withdrawn, and the contents compared. Each tube is stabbed throughout with a small bright spatula. Pure oil gives a hard clean cut, and when the spatula is withdrawn the incision looks like a straight line ; while an adulterated oil will invariably be softer and the incision will have a peculiar feathered effect. An adulteration exceeding 12 per cent. will cause the oil to remain entirely liquid.

Worstall's Test.—100 grms. of the oil are heated in an open metal pan, 6-in. in diameter, over the course of 4 mins. The oil is kept at 540° C., and stirred until it commences to solidify, which should not exceed 7½ mins. for pure oil. When the oil has solidified in the pan, it is turned out while still hot and cut with a knife. Pure oil gives a product that is pale, firm, and cuts under the knife like dry bread, not sticking. If the oil requires more than 7½ mins. after reaching 540° F. until starting to solidify, or if the product is dark, soft, or sticky, the oil should be rejected.

The high dispersion power of the oil is one of its characteristic properties, the dispersion power for typical vegetable oils being as follows : Chinese wood oil, 0.0371 ; linseed oil, 0.0218 ; cottonseed oil, 0.0195 ; castor oil, 0.0190 ; and coconut oil, 0.0167.

Applications of Chinese Wood Oil

Chinese wood oil is used principally as a wood varnish, for the "caulking" of boats, as a waterproofing agent, lacquer component and as a substitute for linseed oil in varnish, linoleum, and paint manufacture. It is also used to some extent in the soap industry, as an illuminant, in Chinese-ink manufacture, and in medicine as an emetic and purgative. The oil finds extensive application in China for preserving the wood of the boats on the inland waterways, and as a waterproofing agent for cloth, silk, and leather, producing articles which are highly efficient substitutes for india-rubber products. The fatty acids of Chinese wood oil are used in the production of spirit lacquers, as a dressing for leather, and for the waterproofing of paper. In the production of *papier mache*—which is a baking operation—the process is not a polymerisation of the oil, but an auto-oxidation. Chinese wood oil has been patented as a substitute for kauri gum in linoleum manufacture, and the gelatinised oil enters into the composition of a large number of commercial products. Steinitzer (*Ger. Pat.*, No. 200,746) has patented a loading material for rubber, made by treating Chinese wood oil with sulphuric acid of 1.688 density. Baekeland (*U. S. Pat.*, No. 1,312,093) has patented a process of veneering metallic

(Continued on page 174)

Ramie or China Grass

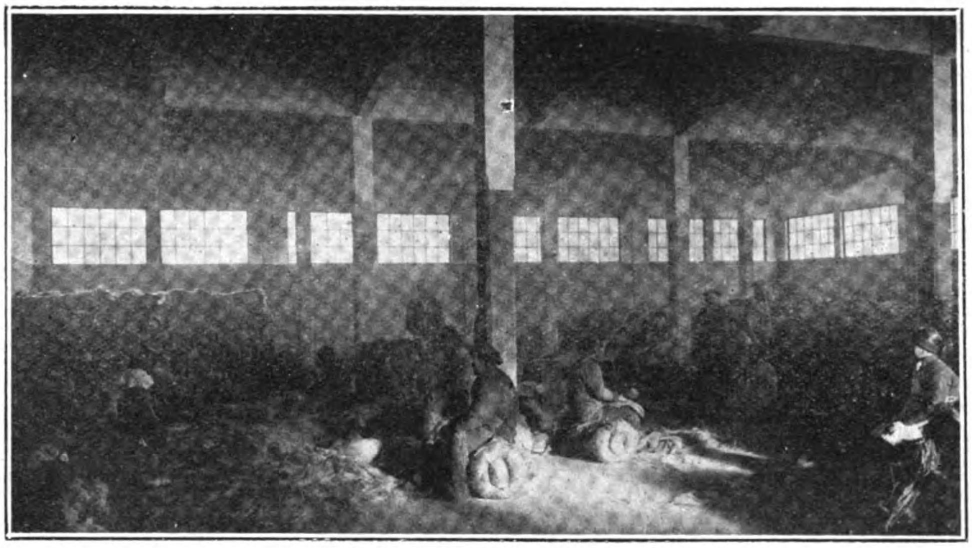
By J. Frank Gillen, Far Eastern Division, Bureau of Foreign and Domestic Commerce
In Collaboration with J. Orlo Hayes, Stanford University

Introduction

THE diminishing supply of certain staple commercial fibers, as indicated by an increasing interest on the part of American manufacturers in some of the rarer fibers, has prompted the publication of this bulletin on ramie or China grass.

Although this fiber has been used for centuries by the Chinese in manufacturing cloth, it is only in recent years that its possibilities as a substitute for other vegetable fibers have been realized by foreign countries. In addition to its many textile uses, ramie grass is employed in the manufacture of cordage, nets, gas mantles, and like articles, and attempts to manufacture paper from it have met with success. While this fiber has not yet been industrialized and is now consumed largely in local markets, during the past four years China's exports of ramie have amounted to about $3,000,000 annually.

Credit is due Mr. J. Orlo Hayes, of Stanford University, for the greater portion of the material herein incorporated—the results of an extensive personal investigation of the ramie fiber in China. This has been supplemented by information gathered from the bureau's own sources and from the somewhat meager and incomplete published reports on the subject.—JULIUS KLEIN, *Director*.



Sorting China grass on the top floor of Jardine, Matheson & Company's produce godown at Hankow

Ramie or China grass, one of the strongest and finest fibers known, is widely cultivated in China, especially in the Yangtze valley provinces. The Chinese name for the ramie plant is hsien-ma, while it is known botanically as *Bœhmeria nivea*. Ramie itself is a non-stinging thistle-like perennial plant belonging to the nettle family. The stems of this plant attain a height of from 3 to 8-ft. and last for a period of five to seven years.

Under average conditions, which require a good, equally distributed rainfall, the stems are harvested three times a year and produce one of the strongest and finest of vegetable fibers. Ramie is extremely durable and has a brilliant silky luster, containing properties that can readily be dyed. It also has the additional advantage of being in its nature more like wool than other plant fibers, and because of its exceptional length, varying from 2½ to 18-in., it can be used as a substitute for long-stapled wool. It can be spun as fine as flax, is stronger, and has a more silky luster. When properly begummed, the relative strength of ramie appears as 100 units compared with hemp at 36; flax, 25; silk, 13; and coton, 12 units.

History and Uses of China Grass

Ramie grass was the principal substance from which the Chinese made their cloth before the introduction of cotton in the country as an important textile material, which was probably about the year 1300. Subsequently, ramie grass gradually became less important, since with the opening of China to foreign trade and the introduction of muslin and linen it was further replaced by these imported articles.

It is only within the last few years that ramie grass has been utilized to any great extent by foreign countries. Experimentation as to the utility of this fiber has led to an increased foreign demand. In addition to its use for textile purposes, which is again important, ramie grass is also employed in China in the manufacture of mosquito and fishing nets, twine, cordage, etc., which are largely exported to Siam and the Straits Settlements. Foreign countries employ it in the manufacture of gas mantles, ropes, lines, nets, underwear, canvas, and similar fabrics. Recent experiments have also proved that ramie grass can be utilized in the manufacture of paper. Large quantities are annually exported to Japan, where it is prepared to resemble silk thread, from which imitation silk garments are produced.

PRODUCTION.

Probably every province in China grows some ramie grass, but the principal ramie-producing provinces are Hunan, Hupeh, Kiangsi, and Szechuan. The best grass is raised in the Hunan and Hupeh provinces. Next to these provinces may be mentioned Kwangtung and Fukien, and then perhaps Shensi. Shansi is said to be also a ramie-producing province, but the conditions of the production there are little known. The following figures, taken from the customs returns, give some idea of the relative importance of the different parts of China in the production of ramie:—

EXPORTS OF RAMIE, BY PORTS, 1917-1921.
(1 picul=133⅓ pounds.)

Ports.	*1917*	*1918*	*1919*	*1920*	*1921*
—	*Piculs.*	*Piculs.*	*Piculs.*	*Piculs.*	*Piculs.*
Changsha	—	39	—	—	—
Yochow	40,480	57,070	37,428	59,590	50,791
Hankow	182,704	179,473	168,167	157,769	138,719
Kiukiang	163,455	167,989	140,280	156,520	146,524
Nanking	10	—	—	—	—
Chinkiang	—	8	—	—	78
Shanghai	116	102	521	340	358
Ningpo	15	173	239	83	—
Foochow	—	9	11	—	3
Swatow	—	88	39	94	27
Canton	12	612	—	6	—
Wuhu..	—	—	—	—	74

From the above figures it will appear that Hankow and Kiukiang are the two most important exporting centres of ramie. Ramie is also extensively cultivated on the hilly plateaus north of Kityang, Kwangtung, about 30 miles from Swatow. Kityang is famous for its grass cloth, which is made from locally produced ramie or that produced in the southern part of Fukien, as well as a large quantity imported from the Yangtze ports, chiefly Hankow. Ramie is also produced in considerable quantities in the western part of Kwangtung.

It is generally recognized that of the three chief ramie products sold on the largest market (Hankow) yuen-kiang grass is the best. It is of a greyish yellow color with a slight tinge of maroon, has the stiffest fiber, and looks the best after a slight dressing. The Wuchang product is whiter, softer, and finer than the Puchi ramie, which is the coarsest of the three grades.

Fukien, like Kwangtung, is better known as a producer of grass cloth than a producer of ramie. Both provinces import a large quantity annually from the Yangtze ports and, in return, export grass cloth, chiefly through Swatow. The area over which ramie grass can be raised is very large. In short, ramie is found in all the warmer parts of China, or could be grown in them up to altitudes of 4,000-ft.

Cultivation of the Plant

The plant requires a hot, moist, equitable climate and rich, damp soil. It is chiefly found in districts having 35 or more inches of rainfall annually, where the soil and character of the land are such that no water stands on the surface.

China grass can be grown in the southern part of the United States, but, due to the high labor cost and the necessity of a great amount of hard labor, it is not profitable.

With most Chinese farmers China grass is strictly a minor crop, and as a result is produced only in very small areas. It is usually grown in glens or other sheltered places, such as inside city or garden walls, where no wind reaches it. No patches are found far away from farmhouses, as the plants require large quantities of fertilizer in the form of manure and also constant care and watching. The patches must, of necessity, be small on account of the limited supply of manure, since big patches would require large amounts of manure, which must be transported by hand. The absence of roads and pack animals in the growing districts makes any kind of transportation, except that by hand, practically impossible.

The average ramie patch consists of from 1 to 4 per cent. of the total area held by the ramie farmer. However, this percentage varies greatly, due to the frequent changing of landholders. This percentage makes the patch from one-twelfth to one-sixth acre each. In some exceptionally large patches, where the farmer's principal interest is the cultivation of ramie, the area may be as large as 1 acre. These large patches are usually found in hilly places, where other crops are difficult to raise.

Methods of Culture.

Propagation may be by seeds, cuttings, or division of the roots. Of these methods the planting by root division is the one generally used by the native Chinese farmers. The best ground for the ramie plantation is said to be the slope of a mountain where it is warm and dry and where water will not remain. Before planting, the ground is thoroughly plowed, after which fertilizers are added. Then holes from 2 to 4-ft. apart are dug, in each of which are buried three or four pieces of root, about 4 or 5-in. long. The depth of the planting is usually 3-in., with at least 1-in. of soil above the buds. The planting may be done either in the spring or in the autumn. Once planted, the ramie will be kept foi five to seven years, and sometimes even longer. In the first and second years no crop is gathered and the stems are cut off early to secure a multiplication of stalks.

In the fall, before the arrival of severe frosts, the plant must be covered with a layer of cow manure to prevent freezing, as well as to fertilize the ground. This layer of manure stimulates the growth of weeds, which come up very rapidly. They are allowed to grow a few inches before being cut. Immediately after they are cut the manure is covered with a thin layer of clay to prevent leaching.

The young shoots start growing about the middle of April. At this time another light application of cow manure is added to the soil to advance growth.

Ramie should not be irrigated, as it causes too rank a growth and makes the stalks branch. Branched and rank growing stalks produce a very poor and uneven fiber.

About June, the first crop is ready to be harvested. This is the hardest task, since the crop must not only be harvested and the ground cultivated and weeded but the fibers must be separated from the rest of the stems.

Harvesting of the Crop

The usual yield is three crops a year. Weather conditions may make the number two or four, but this happens only on rare occasions. Each crop yields about four tons of stems per acre.

The first crop gives a comparatively short grass, up to 30 or 35-in., and is generally sold to Japan. The second crop usually yields the longest fiber, more than 45-in., is softer and more yellow, and hence more attractive to American buyers than the first crop. The third crop is the least important and is harvested at the end of the year, usually in October.

The three crops under average conditions would yield approximately the following amounts of scraped fiber: First crop, 408 pounds per acre; second crop, 240 pounds; third crop, 195 pounds; total, 843 pounds. Under exceptional conditions—good weather and an abundance of fertilizer—the yield can be raised for the first crop to 780 pounds per acre; for the second crop to 480 pounds; for the third crop to 408 pounds; total, 1,668 pounds.

Early or late frosts, high winds, infectious insects or fungus, root rot, lack of manure, lack of cultivation, and weeds are factors which may spoil one or even all of the crops.

From the latter part of May, when the first harvesting begins, until the first killing frost, harvesting is carried on almost continuously. By the time the last of one crop has been harvested the first of the next is ready. For this reason the amount of China grass grown depends largely upon the amount of available labor.

After the Harvest.

The pith and bark of the stalks must be separated from the fiber by a process called "stripping," which is merely the ripping of the bark and fiber from the pith, and is quickly done. Most of the labor is involved in the scraping process.

Before scraping, the stripped ribbons are soaked in water from two to three hours. Then three or four strips of peel are laid on a board at one time. The strips are scraped a few times on the inner side from bulb to point and then turned over and scraped on the outer side. The scraping removes the bark and pith and is done with dull steel or bamboo knives. After scraping, the fiber is dried and then done up in 40-pound bales. These bales constitute the finished China-grass fiber product handled by the native Chinese.

One laborer can strip from 10 to 13 pounds per day, but can scrape only 2 to 6½ pounds of fiber per day.

Production Costs

Labor for scraping, if hired, is reported to be very expensive—at least 8 to 20 cents American money per day plus five meals of good food—principally rice. Two reasons why this labor is so high are because rice fields demand large numbers of laborers and because scraping is considered more or less professional work. The cost of scraping adds from 1½ to 6 cents per pound to the cost of production.

Practically all of the scraping is done by hand. Machines have been introduced into China for the purpose of scraping the fiber, but they have not been able to compete with the cheap Chinese labor.

The cost of production, of course, varies greatly, due to such factors as varying yields, weather, amount of fertilizer used, cultivation, pests, etc. The following figures are based on an average crop under average conditions (three crops a year, with a yield of 840 pounds of fiber per acre):

Labor (on 1 acre):	Days' labor.
February; weeding and manure spreading	30
May, weeding and night-soil spreading	24
July, weeding and night-soil spreading	24
Three times scraping	180
Three times stripping	84
Drying	18
Total	360

Cost of production per acre (U. S. currency):	
360 days' labor at 16 cents per day	$57.60
Night soil	12.70
Cow manure	16.00
Total	86.30

Possibility of Increasing Production

At present the entire yield of China grass is consumed, but present indications point to a doubling or trebling of the demand for ramie fiber to be used in foreign markets for the manufacture of textiles.

Investigations throughout the interior growing districts show that there is an abundance of land adaptable to ramie culture, but there are three obstacles which stand in the way of increased production, as follows:

(1) *Labor.*—Ramie culture and its preparation for market consumption require a great deal of labor, which, in turn, requires capital before returns from sales are forthcoming. However, one-third advance payment is sometimes paid by purchasers of the fiber. This high cost of labor, therefore, tends to prevent large-scale production, as the farmers have not the capital to carry large burdens of expense for hired labor. The result is that the ramie farmer grows very little more, if any more, than can be handled by himself and family, despite the large profit derived from this crop.

(2) *Fertilizer.*—If successfully grown, ramie requires much manure, and as this is quite expensive and very much in demand in China, it is an obstacle which will limit production.

(3) *Chinese Customs.*—The Chinese customs tend to discourage a farmer from raising ramie on his farm if the same practice was not carried on by his ancestors.

However, due to the enormous area over which ramie can be grown and the increasing prices, it seems probable that the law of supply and demand will operate and that production will increase.

In order to stimulate production it has been proposed to operate foreign-controlled plantings of ramie in areas suitable for its growth and culture where it is not already grown. It is expected that this type of experiment, if successful, will interest neighboring farmers in ramie, with the result that they will follow the lead, plant the grass, and thus increase production.

Marketing of the Product

Dealers' marketing of ramie grass in China is a very intricate and many-handed process. Fiber for export is marketed in the following way:—

A. *First Deal.*—Farmer to local storekeeper, who is hired by a ground broker. Before the crop is harvested the local storekeepers, who are hired and financed by ground brokers, advance approximately one-third of the estimated buying price of the fiber expected to be raised by the farmer. This advance payment creates a contract between the ground broker and the farmer (the storekeeper is agent to broker). When the farmer harvests his crop and the fiber is ready for market, he delivers it to the local storekeeper, who in turn gives him the remainder of the purchase price. The storekeeper, as agent to the so-called ground broker, is paid on a commission basis, receiving from 2 to 5 per cent. of the first purchase price. However, as there are no written records kept by the farmer or the local merchant, it is not infrequent that the storekeeper buys from the ignorant farmer at an extremely low figure and adds a "squeeze" to the price when it is turned over to the ground broker.

As the local merchant accumulates the fiber he turns it over to his principal, the ground broker. The ground broker's interest in the grass is purely speculative. He holds it to his best advantage and sells it for what the traffic will bear. The individual ground broker has very limited capital, however, and as a result does not always keep the fiber till the right time, his money being needed for future purchases.

B. *Grass Hong.*—These ground brokers sell their grass to a grass hong. This hong is an association of buyers much like a guild. Practically all of the grass grown in China for foreign shipment is handled by this hong before it is sold to foreigners. The purpose of the hong's existence is purely speculative. Hankow is the headquarters of grass hongs and is also the foreign buying centre of China grass.

C. *Compradore.*—It is the practice of Chinese dealers or hong men never to deal directly with a foreigner but through a compradore, who acts as the foreign firm's go-between buyer. Each foreign firm has its own compradore, who buys from the native Chinese and sells to his firm. The foreign firm makes a contract with its compradore to buy so much fiber at a stipulated price and the compradore guarantees to supply it, adding his commission of 1 to 3 per cent.

D. *Foreign Exporting Firms.*—Several foreign exporting firms, especially those in Hankow and Shanghai, handle ramie fiber for export. In most cases they handle the grass on a commission basis, charging from 3 to 8 per cent., according to circumstances.

Thus it will be found that under the above and existing method of marketing the grass passes through the hands of producer, local storekeeper, the ground broker, the grass hong, the compradore, and the foreign exporting firm before it finally reaches the consumer or textile manufacturer. This means that the fiber passes through five dealers, all of whom add their profit or commission, or both.

The problem which confronts the consumer who wishes to get the grass at a reasonable figure is how to eliminate some of the dealers. However, from all outward appearances, to establish a new system of marketing for part or all of the exported China grass fiber would be a very slow and expensive undertaking. It would be necessary to create an extremely large organization. Under these circumstances the expenses of the organization might be more than the savings due to eliminated dealers, and at any rate very large amounts of fiber would have to be handled to warrant such a large organization. This is a problem which calls for serious consideration in view of the increasing foreign demand.

Transportation and Handling

Hankow, as before stated, is the centre of the ramie fiber market and is the point to which most of the fiber is shipped and where it is put on the market for sale to foreign or domestic consumers. Besides the fiber that is shipped to Hankow, small amounts go to Shanghai, and somewhat larger amounts are used locally for the manufacture of grass cloth.

Most of the fiber is shipped to Hankow via the Yangtze River and its tributaries. Whether the grass is grown up or down the river from Hankow, that is the port from which it is shipped. For instance, fiber grown in Kiangse province is shipped to Kiukiang, which is a port on the Yangtze River, about 142 miles down from Hankow, and from which it is shipped upstream to Hankow.

The grass en route to Hankow is carried in Chinese junks, which resemble antique sail and row boats, varying from 20 to 40-ft. in length and carrying from 1 to 5 tons. They are manned by coolie sailors.

The fiber is sacked in native bales weighing about 40 pounds each. After arriving in Hankow the small native bales are carried on the backs of Chinese coolies to the godowns (warehouses) of the hong dealers. It is from these warehouses that the grass is purchased by exporters. When the grass is sorted into different qualities, about 10 per cent. of it is rejected. Foreign purchasers rebale the fiber into 500 to 600 pound bales. These bales are then carried by coolies to the Yangtze River docks, where they are loaded into ocean steamers.

Native transportation is very crude, involving a great deal of hand labor and more or less delay, but, due to the low wages paid, it is not overly expensive. The following is a tabulation of costs connected with handling of fiber:—

	Per ton.
Average freight to Hankow	$3.40
Coolie hire	2.29
Packing and baling, Hankow	10.20
Export duty	4.58
Insurance and interest	3.38
Freight to the United States	10.00
Total	33.85

Consumption of Ramie Fiber

The estimated figures of the Chinese chamber of commerce for the production of China grass fiber show an average annual yield of 26,000 tons. Of this amount about 10,000 tons are consumed in China. The figures following, given out by the Chinese customs, show the amount exported and the value:—

Year.	Pounds.	Value.	Value per pound.
1919	28,125,467	$3,798,657	$0.135
1920	24,936,000	3,576,409	.143
1921	26,298,933	2,123,255	.800
1922	24,970,666	2,443,046	.970

More than half of these exports go to Japan. England and Germany get a large share, while the amount taken by the United States is very small.

The following table shows the countries to which exports of ramie fiber were made during the years 1919, 1920, 1921 and 1922:

VALUE OF EXPORTS OF RAMIE FIBER FROM CHINA, 1919-1922.

Countries.	1919	1920	1921	1922
	Haikwan taels.	*Haikwan taels.*	*Haikwan taels.*	*Haikwan taels.*
Japan	2,533,937	2,385,818	2,538,104	2,659,805
Germany	—	2,657	21,412	111,625
Great Britain	57,228	302,878	156,005	59,304
Hongkong	66,262	72,787	40,756	53,765
France	26,170	41,468	15,800	31,580
French Indo-China ..	14,716	19,893	20,107	21,939
United States	4,746	541	—	3,967
Italy	129	7,833	—	674
Siam	3,265	3,080	1,217	468
Philippines	423	—	353	212
Singapore, Strait Settlements..	2,386	—	—	90
Netherlands	16,292	31,178	—	—
Belgium	7,060	16,068	—	—
Austria and Hungary ..	233	—	—	—
Total	2,732,847	2,884,201	2,793,754	2,943,429

Current Prices of Ramie

The following table gives the average prices for the three most common and best-known grades of ramie in the Hankow market. These prices are given in Hankow taels per picul, covering cargo delivered f.o.b. steamer Hankow in export bales, including export duty:—

PRICES OF RAMIE PER PICUL IN HANKOW TAELS.

Date.	Puchi.	Wuchang.	Yuenkiang.
1922:	*Hankow taels.*	*Hankow taels.*	*Hankow taels.*
June	20.70	21.60	21.90
July	19.50	20.10	21.70
August	22.20	22.60	—
September	22.50	23.50	—
October	23.50	24.50	—
November	—	26.00	—
December	—	26.00	—
1923:			
January	—	25.00	—
February	—	24.00	—
March	—	26.00	—
April	—	24.00	—
May	—	25.00	—
Opening prices for 1923 crop	21.50	22.50	25.29

NOTE.—Average value of Hankow tael for above periods was approximately $0.7567.

Only Wuchang grass was available in any material quantity after November, 1922. Since January, 1923, practically none of the 1922 crop has been available and the prices shown on Wuchang grass are more or less speculative.

Methods of Financing the Crop

Finance in China carries with it a large risk of exchange, especially when dealing directly with the producer. The following units of money, which are continually changing in relative value, are used in domestic exchange: Cash (smallest unit); coppers; Mexican dollars; taels.

The farmers use cash, the coolie labor is paid in coppers and small money, domestic freight charges are paid in Mexican dollars, and the banking business is done in taels. The difference in exchange values of these various kinds of money make their study an important factor in the ramie fiber business. The exchange value between Chinese money and gold standard money is also constantly changing. Under the present system of financing ramie fiber, the following steps are necessary:—

1. The ground brokers furnish the storekeepers 30 per cent. of the estimated value of the immediate future crop. The local storekeepers, as the ground brokers' agents, turn this 30 per cent. advanced payment over to the farmers and thus bind them on the future delivery of their crop. When the delivery is made they are paid the remaining two-thirds of the value of the crop.

2. The grass hong members at Hankow buy the grass direct from the ground brokers on a cash or credit basis, but usually cash.

3. If the grass is to be used for Chinese consumption, it is bought direct from the hong by the Chinese manufacturer for cash or credit.

3—A. If grass is exported, the foreign exporter opens a letter of credit in a Hankow bank. The firm exporting the grass receives payment from the bank holding the letter of credit on presentation of their documentary draft, bill of lading attached.

3—B. Tfe exporting firm must finance the purchase of the grass from the time it purchases it from the hong until it is shipped and bill of lading is presented to the bank. If the firm is a responsible one, Hankow banks advance them a packing credit, on which the firms draw to cover expenses incurred in connection with the purchasing, packing, etc.

If the consumer created some means of buying more directly from the producer, the risks of exchange would still remain the same, but the method of financing purchases, packing, etc., would also have to be more direct. However, it could still be carried on under a letter of credit placed in a Hankow bank.

The grass is usually insured "with average" before shipment, as it is subject to damage by water. There is also a 5 per cent. export duty in China, which must be paid by the consumer. At the present time there is no import duty on the fiber in the United States.

CHINESE WOOD OIL

(Continued from page 170).

surfaces by treating with a modified Chinese oil, which is stable up to 100° C., and solidified at 160° C.

In the application of Chinese wood oil as a drying oil it has been found that at ordinary temperatures it dries more rapidly than linseed oil, but at higher temperatures the reverse is the case. The Chinese wood oil film is firmer, less elastic and "tacky" than that of linseed oil. Howse (*Brit. Pat.*, 152,095 of 1919) proposes the utilization of nitrated Chinese wood oil as a rubber substitute and insulating material.

The Future of the Industry

The demand for high-quality Chinese wood oil for European countries is steadily increasing, but the quantity available appear to be influenced seriously by the political and economic conditions of the inner provinces of China. Consular reports affirm that at periods extensive oil-producing areas are entirely isolated by the activity of bandits in these particular localities. A U.S. consular report for 1921 states that "there is room for a considerable improvement in the methods of cultivation, harvesting, and expressing, and the installation of modern machinery would, it is stated, increase the production by at least 10 per cent. To further the continued growth of this promising industry in China, government aid is urgently needed. Nurseries should be established where tree selection can be carried out for the benefit of the grower. The present crude methods of crushing the seeds result in a great amount of waste."

China's Hair-net Industry

THE export of hair-nets from Shantung in 1913 to the United States was valued at $719. In 1922 it was valued at $319,322. The hair-net industry is one of China's war babies.

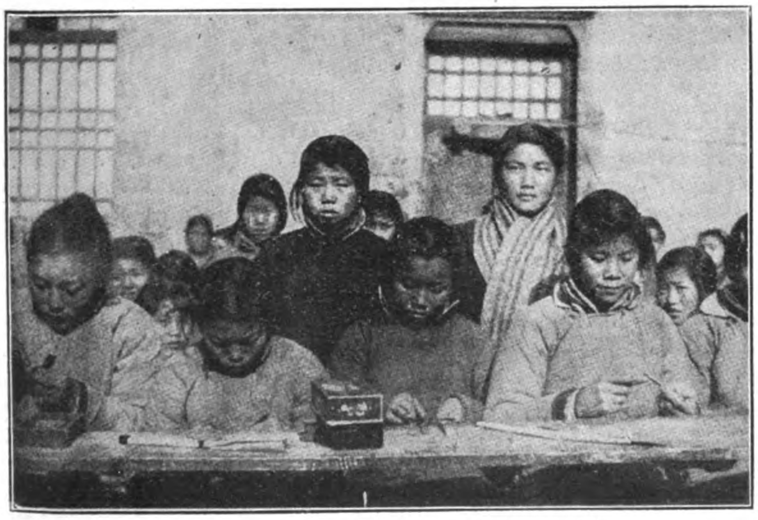
The human hair-net was first manufactured in Austria, and a large industry was built up there which easily drove out the French silk hair-net industry ; cottage labor in the Austrian mountains being used. But the Germans, apparently, quickly discovered in Shantung not only a remarkable source of human hair, but an abundant supply of the cheapest labor in the world, and the manufacture of the nets was transferred to Shantung. The goods were still, however, marketed from Austria, and the secret of the cheap manufacture, namely the use of Chinese labor, carefully guarded until a careless worker left a scrap of a Chinese newspaper in a package containing a net, according to the story. An American buyer discovered this, and investigation disclosed the real source of the nets. This brought American capital into the hair-net industry, and at the present time most of the production is in American hands. The principal consumer has always been the United States. The Chefoo trade report of 1922 show an increase in the exports of hair-nets from Hk. Tls. 2,858,000 in 1920 to Hk. Tls. 7,175,000 in 1921 and states that the hair-net industry now dominates the local trade and industry, in value of goods produced, in amount of work involved, in number of persons employed, and in its effect upon the local standard of living. Shantung is the home of the industry, but at present keeps its hold only on the manufacture. The raw material, human hair, is purchased all over China, notably at Hankow, Canton and Hongkong, and shipped to Europe or America, where it is chemically treated, and then returned to China, where it is made up into nets in the villages, and then re-exported in finished form, chiefly to the United States, with England and France next important takers.

Repairing hair-nets in the warehouse of a large exporting firm

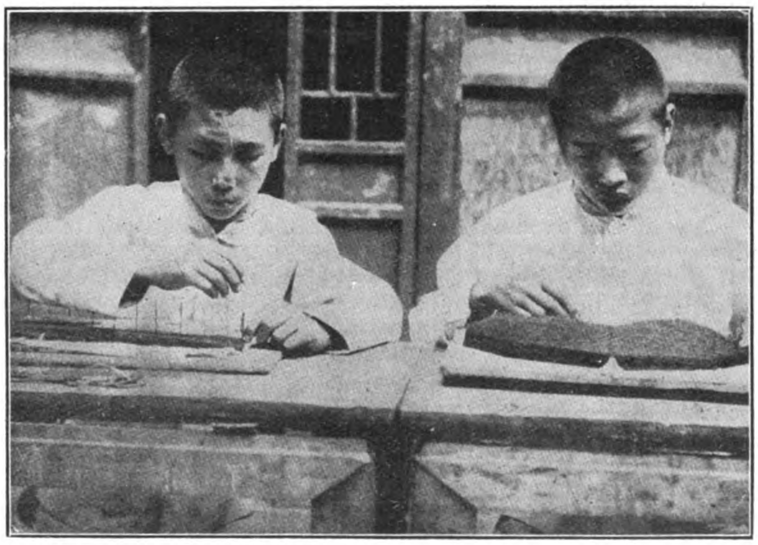
The original cause for the growth of the hair-net industry in China was the abundance of cheap and usable human hair. The rule of the Manchus compelled men as well as women to wear long hair, and the overthrow of the republic threw this hair on the market. Poverty and famine compell women to part with their hair at low rates ; Chinese economy saves the cuttings and combings. It is also said that Chinese hair, being coarser, is stronger and more adaptable than the fine hair of European women for the making of hair-nets.

The second advantage which helped China to take the industry away from the rest of the world is the cheapness of labor. The highest paid employee in the hair-net industry, the inspector, receives $25 Mex. per month, while the workers receive from $22 down to $9 monthly, the latter being the minimum wage for fourteen-year old girls. The average labor cost is one American cent per net, involving a thousand knots to complete. The impossibility of competing with this low labor cost is obvious. Foreign firms are able to provide well-lighted rooms, clean conditions for the workers, regular intervals for food, double pay for over-time and Sundays, and three days holiday a month, and in some cases full pay if sick for a day or two ; and still find labor costs extremely low.

The placing of the nets in paper envelopes ready for the retail seller, most firms have found much more profitable to have done abroad, as although the foreign girl's wages are many times greater, she can be depended upon to pass only perfect nets, a very essential point, and at the same time divides imperfect nets into second quality and discards.



Famine victims learning to make hair-nets

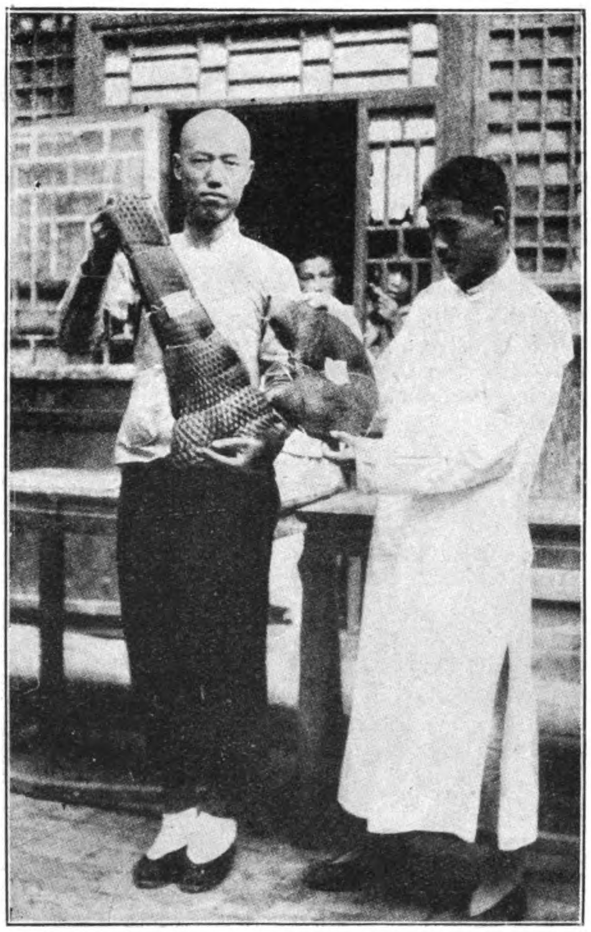


Tying up the nets in one-gross lots

One more essential stage in the process cannot feasibly be done in China, chemical treatment, and this necessitates the shipment of the raw hair to Europe or America for chemical treatment. When the hair has been properly sorted, dyed, sterilized, it is re-shipped to China to be woven into nets in Shantung.

But as the industry has developed, the preparation of the hair has also been transferred in great part to China. Probably nine-tenths of the hair-nets exported from China at present are made from hair that has been prepared in that country, though the Chinese firms have not yet mastered the scientific processes and their product is somewhat impaired by crude methods and careless treatment. At least one American firm has already completed arrangements to prepare its own hair in China under the supervision of expert American chemists. The various colors are thus produced for hair-net making, namely, light, medium and dark brown, blond, black, auburn, and white.

The making of the nets is done in the village homes, giving the advantage of greater cheapness, while the repair work is done in work shops in and about Chefoo which give the advantage of better inspection. The industry spread rapidly from village to village in Shantung when the big growth came in 1914; trained teachers were sent through the country side by firms who trained the girls on condition that when they had learned the trade, which takes about a month, that they sell their goods exclusively to the company training them. The pay is judged by all western standards, pitifully small, but according to the village standards is very good, and is welcomed by the parents.



Hair-nets as they are shipped

Home manufacture has its serious disadvantages as well as its merits. Nets made by the piece, with no chance for supervision, naturally are not as well made as in a factory, where the work can be supervised by experts. Many of the nets bought by the exporting firms are imperfect and have to be gone over carefully, one by one, before shipment. This is done in the workshops run by the exporting firms in such cities as Chefoo.

The repair work has created abnormal conditions in Chefoo. It has raised all wages, as the work is so simple and easy, save perhaps on the eyes, and workers so much in demand that it attracts labor from every direction. The American mission, for instance, has the utmost difficulty in keeping women nurses, and when the minimum earning of girls of 14 years is $9 their parents are not prepared to work longer, as they can live on the earnings of their families. The higher standard of living which such earnings allow, raises the price of food, while the influx of country folk for such work has raised house rent several times, both by creating a shortage and because several workers can afford to share a house at $15 or $20 a month, dispossessing an ordinary tenant who paid $5 and cannot afford the landlord's demands.

One of the explanations of the rapid development of this industry while other industries are slow to take advantage of the local cheap labor, lies in the fact that machinery is not needed. Cheap labor alone has not made possible the development in the same area of industries requiring large capital outlay in equipment, but in the hair-net industry the only tools necessary are a small brass shuttle and a bamboo splint. On a nail driven into a table or chair the first loop of the net is fastened. The hair is wound into the shuttle, like thread into a bobbin, and as each new loop is tied it is slipped into the bamboo splint like a stitch on a knitting needle. Thus, with shuttle in one hand and bamboo splint in the other, the maker adds knot to knot and loop to loop until the net is completed.

The nets are then tied together in bunches of one gross each. For this a piece of board, into which nails have been driven is provided, and the loops on the edge of the net are slipped over the nails until a pile of 144 nets is made. They are then tied with thread and are ready for the agent when he comes to collect, pay for making, and to leave more hair. Tying into one-gross bunches, as well as tying the hair into one long thread and putting it into the shuttle, is often done by some member of the family who is not able to make the nets. Thus the industry fits in well with Chinese home life.

The hair-net comes in various shades. The hair of the Yak's tail, because of its whiteness and length, is very desirable when mixed with other shades in producing a silvery effect that matches grey or partially grey hair. The raw hair is graded according to length, the first grade exported being dressed in lengths of from eighteen to thirty-six inches, while the second grade is made up of strands measuring fifteen inches or under. The price of hair for export during 1922 ranged between $200 and $800 per hundred catties.

America consumes mostly cap nets of the sizes 8 by 38, 10 by 38 and 12 by 38, while Europe uses principally the so-called fringe nets.

There is no difference in the prices as to the colors with the exception of grey and white, which are always more costly.

The industry was threatened at one time by careless handling on the part of exporters. The trade requires 90 per cent. perfect nets on arrival, though the nets are very fragile, and in 1920-1922 exporters shipped to the United States enormous quantities which turned out to be only from 40 to 50 per cent. perfect, a result of careless inspection and careless packing, the result being that millions of dollars worth of useless nets were lying about the New York market unsold and unsaleable.

The hair-net industry has for some time suffered from the present fashion among American girls of "bobbing" their hair and much money has been spent in propaganda work in America in order to retain the business by urging upon the women not to bob their hair.

To date the Chinese government has levied only slight taxes on the industry. Last year, however, a proposal was made by the government to tax this industry, which was met by strong representations on the part of the trade, who say that high taxation would take away the livelihood of millions and a profitable trade for China; the matter is still pending.

Another difficulty the trade is facing is the increased popularity of the double hair net, which lasts considerably more than twice as long as the single net, and is said to have already caused a serious drop in sales. Importers in the United States are said to be now in favor of a ratio of four single nets to one double net. The difference between the two varieties lies in the use to which they are put. The double net holds the hair down and is suitable for sports and motoring; and is used by factory workers. The single net, which does not show as much, is used for dress occasions and the like.

Since demand for this commodity depends solely upon quality, the best import firms exercise great care in dealing only with well-established firms, for only strict supervision on the production end can insure quality.

*Illustrations from "The National Geographic Magazine."

Chinese Engineering Materials

Joseph H. Ehlers

Editor of the "Journal of the Association of Chinese and American Engineers"

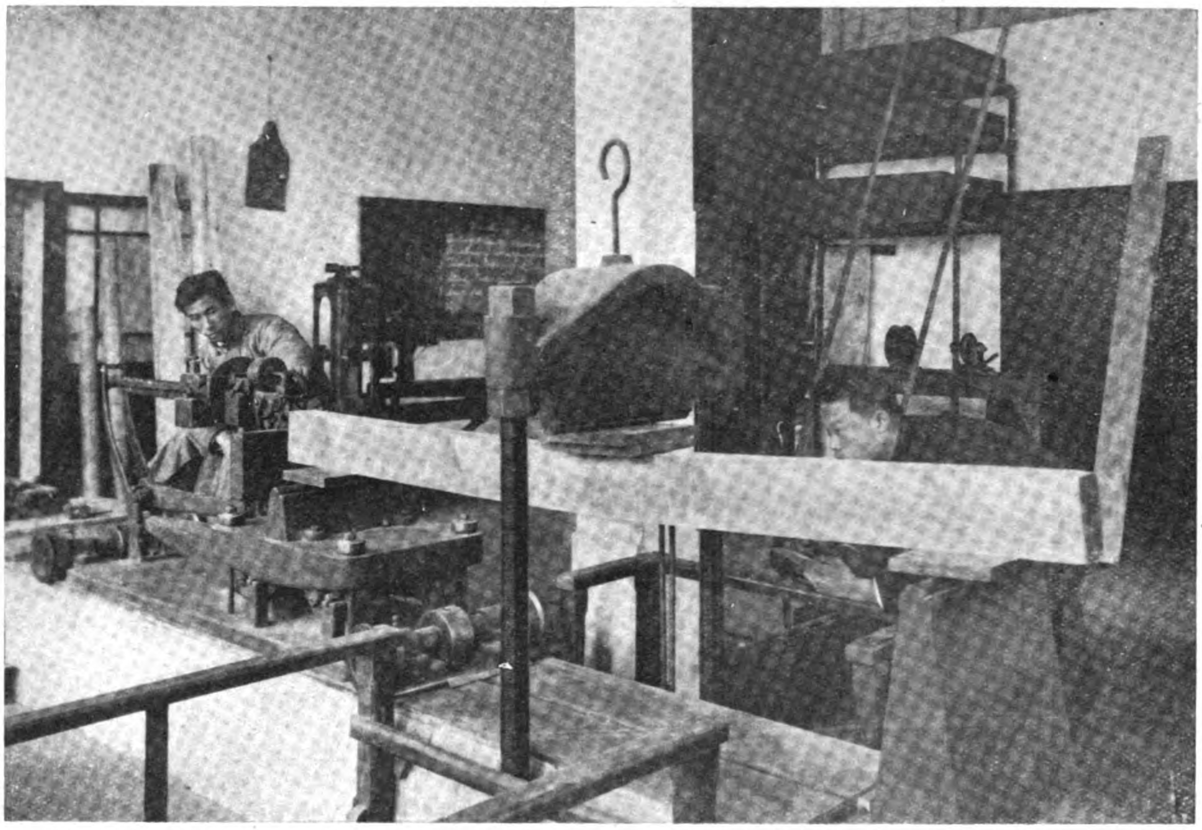
OF the great nations of the world to-day, China alone has no organization or facilities for studying the materials of construction. As a consequence, engineers are handicapped for lack of data on locally produced materials; and are therefore often compelled to resort to the use of expensive foreign materials whose properties are better known, and which are purchased in accordance with carefully prepared specifications regarding methods of production and the physical and chemical properties required.

It seems unbelievable that a country with 400,000,000 people, with enormous engineering projects planned on every hand should have neglected so vital a subject as the testing of engineering materials; yet such has been the case. Not only has there been practically no work in the nature of an investigation to determine the properties of native products, but often products have been used in actual construction without testing of the quality of the several shipments of materials.

Many materials peculiar to China are adaptable to modern construction, for example bamboo, a material so scarce in most large countries as to be negligible as a material for use in construction; and hence but little tested; in China, abundant in many parts and well nigh indispensable. The peculiar economic conditions of China entirely alter the problem of the economic use of construction materials. Due to these conditions, such combinations of materials as lime and volcanic ash and similar mixtures; bamboo reinforcement for reinforced concrete for bearing and sheet piles; and other combinations uncommon in other countries must receive serious consideration in China. To convince the skeptical that these are practical matters, it ought only to be necessary to remark that lime—earth mixtures have been and are being used for much important building work; that prominent engineers believe that some hydraulic lime and volcanic ash mixture might economically be used on harbor projects now under consideration; that bamboo reinforced concrete piles have been successfully used on important work at a cost of not over one-half that of steel reinforced piles.

The remoteness and inaccessibility of vast and densely populated parts of China prevent, in these regions, the use of foreign style products, which are produced near the treaty ports of the coast or are imported; and construction work in such regions must be done with native materials.

In construction work in China there are three classes of materials to select from: (1) imported products, sold in accordance with carefully studied specifications; (2) modern foreign style materials produced in China by imported machinery of foreign methods, which may be purchased in accordance with specifications adapted from studies of foreign countries; and (3) typical native products, for which no scientific specifications regarding manufacture or properties exist, as they have never been subjected to scientific classification or experiment. Little can be done in determining the most economic materials to use until the properties of the native materials have been thoroughly investigated.

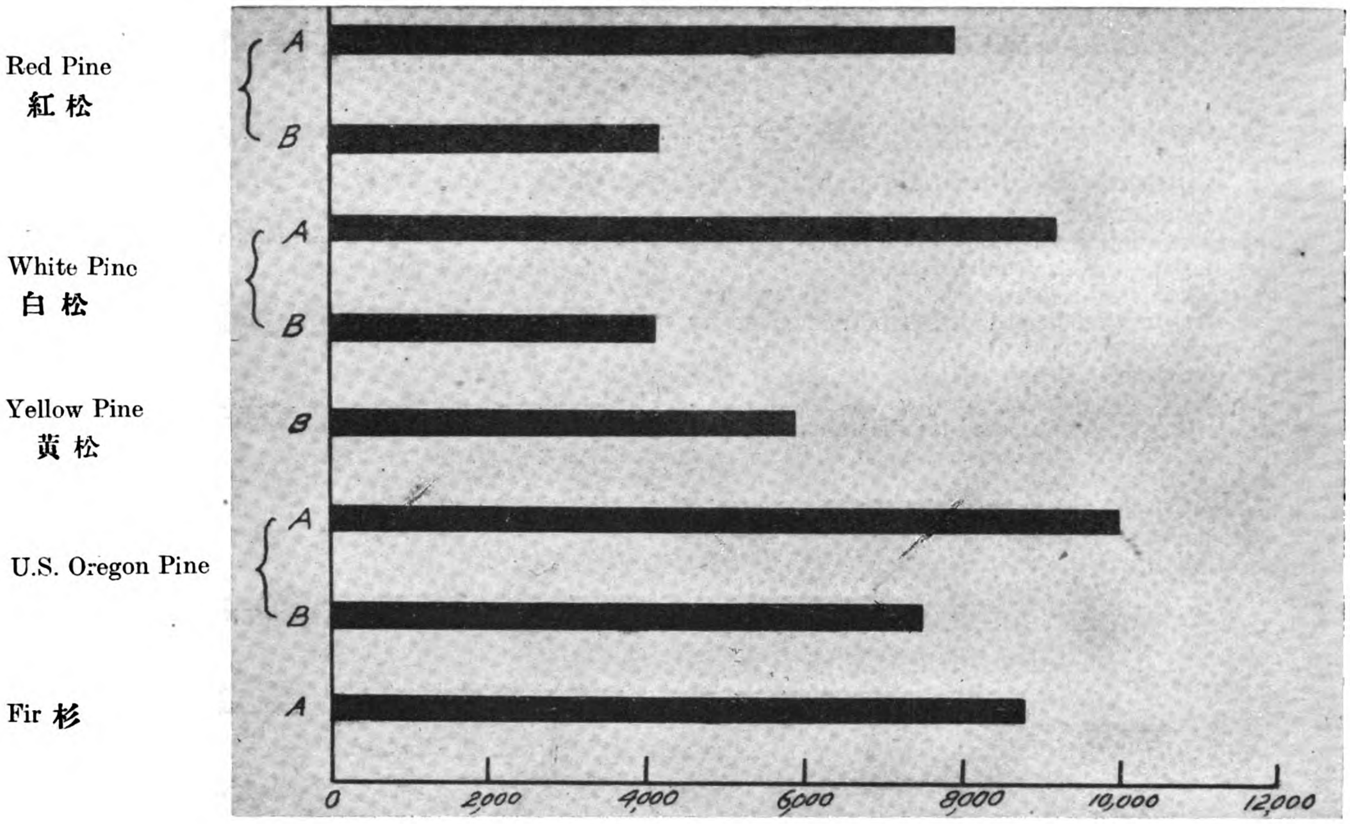


Bending test on timber beam at the Pei Yang University Engineering Material Laboratory

The principal features of such an investigation would be to make studies (1) of the quality of and working stresses for masonry of native bricks; (2) of the merits and properties of various lime mixtures; (3) of the use of bamboo as a substitute for steel for reinforcing for reinforced concrete for temporary structures; (4) of the quality of the cements produced here; and (5) of the properties of Chinese timbers.

This work would fall into four parts: (1) laboratory tests; (2) field tests; (3) examination of existing structures; (4) classification of each product and the formulation of specifications for control of producing processes and for physical and chemical requirements, based not on specifications for foreign products but on a study of what can be best produced here (varying designs to adapt them for

STRENGTH OF CHINESE TIMBER. TRANSVERSE TESTS ON LARGE BEAMS



Transverse strength in lbs. per sq. in. Note: A. Seasoned; B. Green

Chinese materials if necessary). The basic work is the determination of strengths by laboratory tests.

The government has evidenced an interest in undertaking some work along these lines when conditions are suitable for progressive endeavors. The writer was appointed an honorary technical councillor to the ministry of communications in 1922 in this connection and urged by the minister of communications and the director of the railway department to do everything possible to further the interests of the study of materials for construction work in China. By extensive travel and through personal contact with those in a position to assist, he has endeavored to promote an interest in this work and effect a means whereby something may be accomplished even under the present conditions. Eminent men in this field, such as Dean Middleton Smith of Hongkong University, who has done much testing of great value, have offered to co-operate, and the university testing laboratories have offered to assist. The various river conservancies are undertaking some investigations in connection with their own construction work. Foreign construction interests will undoubtedly do some work in connection with projects in their hands. And thus when and if the Chinese government endeavors to effectively organize the facilities for testing and establish any bureau for co-ordinating the work, and undertaking some of its own, it is hoped that it may find considerable data already at hand and some of the preliminary work done.

Some work has been done under the writer's direction on the following materials: timber, bricks and brick masonry, lime mixtures, cement, bamboo reinforced concrete, building stone.

Timber

Timber is a difficult material to classify in regard to strength owing to the great variation in strength shown by different specimens of the same wood. Differences in age of tree from which it is cut, climatic influences, season of felling, seasoning of the timber, as well as defects, exert a great influence on strength. Timber of structural grade should be purchased to satisfy certain specifications. Native timber is not often so graded.

Small test specimens should be of thoroughly sound wood, and the values of strength deduced from tests on such specimens must be interpreted as applying only to properly graded or carefully inspected timber, and not to the average timber found on the Chinese market.

As an indication of the variation in strength that may be expected in tests, note the following values from tests on longleaf pine made by the United States department of agriculture:

Weight	29—64-lb. per cu. ft.
Tensile strength	1.85—13.4 tons per sq. in.
Compressive strength ..	2.04—4.05 ,, ,, ,, ,,
Bending strength ..	1.9—7.65 ,, ,, ,, ,,
Shearing strength ..	0.21—0.58 ,, ,, ,, ,,

Much work has been done in the investigation of Chinese wood from a botanical standpoint, but little from an engineering viewpoint. Dean C. A. Middleton Smith of Hongkong University has tested many timbers used in South China, coming from the Philippines and from Borneo. Japanese authorities have done some valuable work on the timbers of Manchuria.

Tests on large numbers of specimens are necessary before reliable values of strengths can be obtaind. Many of the following tests were made on commercial timber as purchased in the local market. Although the past history of most of such timber was unknown, the degree of seasoning is revealed by the moisture content test. There are also many tests on green timber, as well as some on thoroughly seasoned timber. Specimens of important commercial woods were collected from various parts of the interior for testing. A great number of tests relate to Manchurian red pine and Manchurian white pine, the most widely used native timbers in North China.

Many of the largest timber using districts are entirely denuded of forests. The timber of the interior is used locally, except that grown in the valleys of the Yangtze and Yellow rivers where large quantities are floated down in rafts. Manchuria and Siberia, as well as Japan, are important suppliers of timber. Woods from the Philippines, Borneo, and Australia are used extensively in South China. Much Oregon pine is imported into all parts of China from America.

It is not considered desirable to attempt to specify allowable unit stresses for Chinese timber on the basis of the insufficient number of tests thus far made however, engineers using Chinese timbers in their designs may be guided by these results, and by applying a factor of safety depending on the importance of the work and the care with which they expect to inspect the purchased timber, may work out reasonable unit stresses. It is believed that not over four-fifths of the stresses allowable for oregon pine structural timber should in any case be permitted.

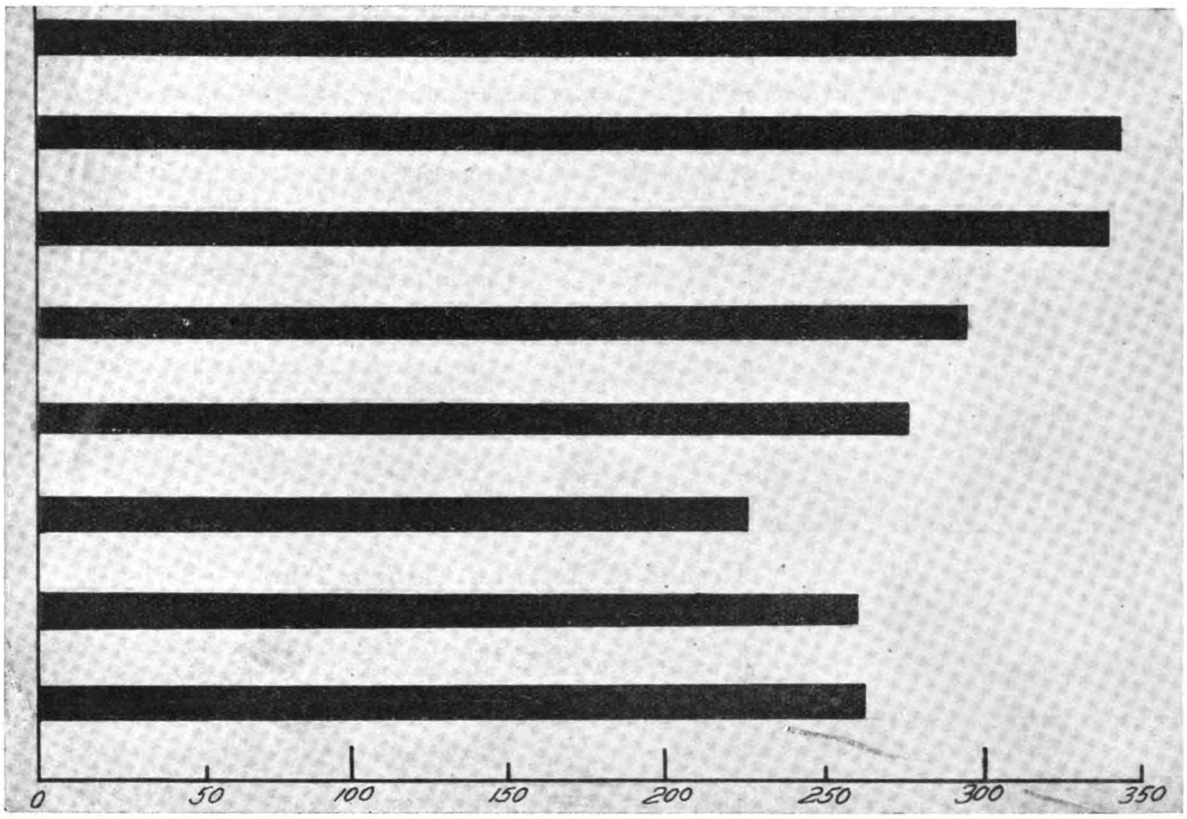
Some results of timber tests are shown: also some results of tests on Borneo and Siam woods used in South China are appended for reference.

A sample summary report form shows the general sizes of specimens used.

Cement

Some tests on cements used extensively in northern China are shown. These particular tests were from samples taken from cements from the market and were made simultaneously under the same conditions, largely by Mr. J. L. Chen, associate member A. C. A. E. under the writer's supervision, and they are in fair agreement with other tests on these cements made in this laboratory. The names of the brands are of course omitted as there is no justification for classifying cements on the basis of a few tests on random samples. What is desired is to impress on users of cement the necessity of testing all cement on the job, for even some shipments of the best cements may not be up to standard.

COMPARATIVE TENSILE STRENGTHS OF CEMENTS TESTED



Tensile strength in lbs. per sq. in. 1:3 sand briquettes, 28 days

Crushing Strength of Far Eastern Timbers Tested in the University of Hongkong

Name of Wood	Country of Origin	Mean Crushing strength parallel to grain lb. per sq. in.	Tons per sq. in.
Billian ...	British N. Borneo ...	11,177	4.99
Selangan Batu ...	" ...	8,713	3.89
Mirabow ...	" ...	7,997	3.57
Mai Takien ...	Siam	6,470	2.89
Camphor... ...	British N. Borneo ...	5,532	2.47
Oba Sulu... ...	" ...	5,398	2.41
Kruen	" ...	4,860	2.18
China Fir ...	South China ...	4,030	1.80
Mai Yang ...	Siam	3,783	1.69

Bending Strength of Far Eastern Timbers Tested at the University of Hongkong

Name of Wood	Country of Origin	Coeff. of Bending Strength Tons per sq. in.
Selangan	British North Borneo	8.06
Billian	" ...	7.29
Mirabow	" ...	6.77
Mai Takien	Siam	5.38
Camphor	British North Borneo	4.93
Greenting	"	4.92
Oba Sulu	"	4.92
Orat Mata	"	4.57
Kruen	"	4.45
Kacha	"	4.24
Red Serayah ...	"	3.54
Mai Yang	Siam	2.99
Black butt	Queensland	5.79
Spanish oak ...	St. Vincent	5.78

Pei Yang University

Engineering Materials Laboratory

TIMBER TEST REPORT—SUMMARY SHEET.

Results of tests on *Manchurian Red Pine* Locality *Manchuria* Seasoning *Unseasoned* Moisture content 32.0 per cent. weight per cu. ft. 34.2-lb.

CROSS BENDING :—15 tests

Size of test pieces	6-in. by 12-in. by 12-ft. 0-in.
Modulus of rupture	3,649-lb. per sq. in.
Modulus of elasticity	1,136,500-lb. per sq. in.

COMPRESSIVE STRENGTH :—12 tests

Size of test pieces	3½-in. by 3½-in by 12-in.
Fiber stress at ultimate, parallel to grain	2,542-lbs. per sq. in.

TENSILE STRENGTH :—30 tests

Size of test pieces. 1¼ *cm.* by 3 *cm.* and length 52 *cm.*
1½-in. diam. and length 15-in.
Fiber stress at ultimate, parallel to grain 6,650-lbs. per sq. in.

SHEARING STRENGTH :—10 tests

Size of test pieces	6-in. by 6-in. by 12-in.
Ultimate stress, perpendicular to grain...	605-lbs. per sq in.

REMARKS.—Average results of tests on all specimens from 5 logs.

Cement No. 1

NORMAL CONSISTENCY :—Vicat needle ; 25.50 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 2.66 per cent. No. 200 sieve 15.58 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 29.50, 29.69.*
INITIAL SET :—Gilmore : 5 hrs. 50 min.
FINAL SET :—Gilmore : 9 hrs. 10 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests		4	4	4	4
Average Strength ...		402	623	214	276

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		3:9 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1414	2005

CHEMICAL ANALYSIS :—SiO_2 17.88 per cent. MgO 1.52 per cent. SO_3 1.51 per cent.

* Sample heated.

Results of Tests on Chinese Timber—Series 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
					STATIC BENDING				COMPRESSION				TENSION		SHEAR		
									Parallel to Grain		Perpendicular to Grain						
SPECIES	LOCALITY WHERE GROWN	SEASONING	Moisture Content	Wt. per Cu. Ft.	Fiber Stress at E. L.	Modulus of Rupture	Modulus of Elasticity	No. of Tests	Ult. Stress	No. of Tests	Ult. Stress	No. of Tests	Ult. Stress parallel to Grain	No. of Tests	Ult. Stress perpendicular to Grain	No. of Tests	REMARKS
			Per Cent.	lbs.	lbs. per sq. in.	lbs. per sq. in.	lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		lbs. per sq. in.		
NEEDLE LEAVED																	
Red Pine	Manchuria	Unseasoned	31.99	34.2	—	3,649	1,136,500	15	2,542	12	417	15	6,650	30	506	10	From the same log
,,	,,	Six months	—	27.2	—	3,010	1,320,000	12	3,780	10	—	—	6,195	10	745	10	(From the same log)
,,	,,	Seasoned	10.25	—	—	5,598	1,135,700	11	3,810	22	—	—	6,850	7	1,177	14	(From the same log)
,,	,,	Unseasoned	40.57	29.9	4,200	5,755	1,062,000	4	4,160	21	304	10	8,500	14	1,239	10	
,,	,,	Seasoned	22.2	27.5	6,050	10,200	2,810,000	2	4,705	2	360	2	7,275	2	1,303	2	
White Pine	,,	Unseasoned	—	27.3	—	4,895	1,159,700	17	2,433	—	177	—	6,923	—	462	—	From the same log
,,	,,	2 Years	12.46	24.4	—	5,885	1,892,000	17	3,981	26	429	26	6,412	12	985	26	(From the same log)
,,	,,	Unseasoned	80.71	27.6	3,250	5,330	1,160,000	4	3,260	5	163	5	6,830	15	1,047	7	
,,	,,	Seasoned	—	25.8	6,335	12,520	2,160,000	2	4,185	2	259	2	6,125	2	906	2	
Yellow Pine	,,	Unseasoned	50.09	28.1	4,170	5,940	1,218,000	4	3,000	3	281	5	11,200	12	1,430	5	
Larch	,,	Seasoned	—	29.8	6,370	12,900	2,480,000	2	3,860	2	366	2	4,500	2	355	2	
Oregon Pine*	,,	Seasoned	—	37.7	—	10,200	2,265,000	1	6,160	2	618	2	6,875	2	1,410	2	
BROAD LEAVED																	
Ash	——	Seasoned	—	—	—	—	—	—	4,615	2	590	2	8,650	2	2,438	2	
Elm	——	,,	—	43.8	—	—	—	—	4,455	2	465	2	15,600	2	—	—	
Lime	——	,,	—	35.0	6,320	9,800	2,400,000	1	3,860	2	589	2	6,050	2	1,465	2	

*Imported from America. Commonly used in China.

Results of Tests on Chinese Timber—Series 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14
						STATIC BENDING			Compression Parallel to Brain				
SPECIES	Locality where Grown	Rings per in.	Proportion of Summer Wood	Moisture Content	Wt. per Cub. Ft. Basedon Volume when Tested	Fiber Stress at E. L.	Modulus of Rupture	Modulus of Elasticity	Fiber Stress at E. L.	Crushing Strength	Compression Pərpend'cular to grain Fiber Stress at E. L.	Tension Parallel to Grain	Shearing Strength Parallel to Grain
			per cent.	per cent.	lbs.	lbs. per sq. in.	lbs. qer. sq. in.	1000-lb. por sq. in.	lb. per sq. in.	lb. per sp. in.	lb. per sq. in.	lb. per sq. in.	lb. per sq. in.
NEEDLE LEAVED													
Best Sha-mu (Fir)	Szechuan	27	43	19.0	28.4	50.80	9,200	1,340	5,640	7,640	610	7,320	1,837
Sha-mu (Fir)	,,	12	30	13.8	27.9	3,820	7,640	807	3,480	4,850	682	5,010	1,522
Hung Tou Sha (Red Bean)	,,	27	40	12.0	23.7		—	—	3,650	5,170	813	—	674
Average Sha-mu (Fir)	Hupeh	8	42	13.0	25.0	5,140	8,500	1,190	3,910	5,870	642	4,890	1,070
Liu Sha (Fir)	Chekiang	14	35		31.8	6,900	11,140	1,420	3,940	5,540	—	11,460	568
Chen Sha (Fir)	,,	7	31			4,690	7,980	1,285	—	—	396	8,430	775
Po-mu (Cypress)	Szechuan			18.3	32.2	4,490	9,060	1,340	5,590	7,400	1,180	8,170	700
,, (...	Chekiang	6	32	17.0	36.3	7,350	14,540	1,240	4,770	1,220	1,280	7,760	1,157
Red Pine	Manchuria	18	45	11.3	25.3	3,590	5,490	1,332	—	—	—	7,610	—
Huang Hwa Pine	,,	21	37	11.1	29.4	3,620	7,080	1,553	—	—	—	6,610	—
White Pine	,,	12	35	96.1	23.7	3,740	6,320	1,516	—	—	—	9,226	—
Chekiang Pine	Chekiang	12	49	17.2	33.2	5,920	12,280	1,590	4,740	6,580	518	12,540	822
Foochow Pine	Fukien	11	40	11.5	34.6	6,760	14,630	1,553	5,163	6,800	660	7,030	933
BROAD LEAVED													
Yu (Elm)	Chihli	4	45	52.7	33.4	3,300	6,600	1,050	2,000	3,380	537	8,930	620
Willow	,,	5	30	56.0	29.6	3.620	6,090	867	2,180	3,120	409	7,060	672
,, ...	,,	5	30	12.9	27.0	6,330	11,240	1,300	2,660	4,530	688	—	946
Pai Yang (Poplar)	,,	7	35		33.9	4,810	7,820	1,608	3,500	5,240	543	9,290	860
Nan-mu	Szechuan	—	—	12.3	31.7	5,820	11,120	1,360	4,393	6,695	882	13,300	1,286
P'a	,,	8	28	14.7	26.8	—	—	—	3,170	4,710	474	7,360	1,242
Pai Ye-ho	,,	—	—	12.5	26.7	—	—	—	4,945	6,635	1,510	6,010	—
Tzecheng	,,	—	—	12.5	49.3	—	—	—	5,070	7,610	—	—	1,620
Feng	Chekiang	—	—	32.2	—	—	—	—	2,600	4,260	701	—	1,023
Wu-tung	,,	4	22	11.1	38.8	3,670	7,340	995	2,440	3,500	583	4,160	567
Huai	,,	7	32	—	—	—	—	—	2,820	5,080	1,263	—	1,364
Tuan (Lime)	Manchuria	12	44	95.0	—	3,140	5,300	1,250	2,740	4,620	583	10,300	—

Cement No. 2

Normal Consistency :—Vicat needle ; 22.78 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 3.72 per cent. No. 200 sieve 18.78 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.099, 3.107*
Initial Set :—Gilmore : 5 hrs. 50 min.
Final Set :—Gilmore : 8 hrs. 20 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.
Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests		4	4	8	8
Average Strength ...		521	631	215	317

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1488	2603

Chemical Analysis :—SiO_2 21.80 per cent. MgO 1.14 per cent. SO_3 1.05 per cent.

* Heated sample.

Cement No. 3

Normal Consistency :—Vicat needle ; 21.86 per cent. of water.
Fineness :—Residue by weight.
No. 100 sieve 3.64 per cent. No. 200 sieve 19.07 per cent.
Specific Gravity :—Le Chatelier's bottle ; 3.106, 3.166*.
Initial Set :—Gilmore : 4 hrs. 10 min.
Final Set :—Gilmore : 7 hrs. 40 min.
Soundness :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.
Tensile Strength :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests ...	4	8	8	12	12
Average Strength ...	68	497	727	161	250

Compressive Strength :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	4200	9680	763	2420

Chemical Analysis :—SiO_2 21.02 per cent. MgO 1.29 per cent. SO_3 0.82 per cent.

* Heated sample.

Cement No. 4

NORMAL CONSISTENCY :—Vicat needle ; 23.69 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 1.47 per cent. No. 200 sieve 17.70 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 3.098, 3.101*.
INITIAL SET :—Gilmore : 5 hrs. 30 min.
FINAL SET :—Gilmore : 8 hrs. 30 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	8	8
Average Strength ...	232	594	636	175	218

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	5460	7085	1251	2022

CHEMICAL ANALYSIS :—SiO_2 18.72 per cent. MgO 1.20 per cent. SO_3 0.97 per cent.

*Heated sample.

Cement No. 5

NORMAL CONSISTENCY :—Vicat needle ; 27.00 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 3.20 per cent. No. 200 sieve 16.72 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 2.964, 2.984*.
INITIAL SET :—Gilmore : 5 hrs. 40 min.
FINAL SET :—Gilmore : 9 hrs. 20 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests		4	4	8	8
Average Strength ...		400	455	154	240

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests			4	4
Average Strength ...			1090	1745

CHEMICAL ANALYSIS :—SiO_2 19.72 per cent. MgO 1.52 per cent. SO_3 1.51 per cent.

*Heated sample.

Cement No. 6

NORMAL CONSISTENCY :—Vicat needle ; 23.47 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 0.29 per cent. No. 200 sieve 18.82 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 3.100, 3.106*.
INITIAL SET :—Vicat : 3 hrs. 52 min. ; Gilmore : 5 hrs. 32 min.
FINAL SET :—Vicat : 8 hrs. 12 min. ; Gilmore : 8 hrs. 32 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.

TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	7	6	11	11
Average Strength ...	233	640	704	219	298

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	5	5	4
Average Strength ...	7700	9250	1620	2580

CHEMICAL ANALYSIS :—SiO_2 21.76 per cent. MgO 1.47 per cent. SO_2 1.54 per cent.

*Heated sample.

Cement No. 7

NORMAL CONSISTENCY :—Vicat needle ; 23.37 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 1.46 per cent. No. 200 sieve 18.90 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 3.143, 3.151*.
INITIAL SET :—Vicat : 3 hrs. 30 min. ; Gilmore : 4 hrs. 0 min.
FINAL SET :—Vicat : 5 hrs. 50 min. ; Gilmore : 7 hrs. 10 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.
TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	14	12
Average Strength ...	330	599	638	230	312

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	5	4	5	5
Average Strength ...	6640	8300	1375	2040

CHEMICAL ANALYSIS :—SiO_2 21.44 per cent. MgO 1.22 per cent. SO_3 1.75 per cent.

*Heated sample.

Cement No. 8

NORMAL CONSISTENCY :—Vicat needle ; 22.56 per cent. of water.
FINENESS :—Residue by weight.
No. 100 sieve 3.51 per cent. No. 200 sieve 22.77 per cent.
SPECIFIC GRAVITY :—Le Chatelier's bottle ; 3.097, 3.112*.
INITIAL SET :—Gilmore : 5 hrs. 20 min.
FINAL SET :—Gilmore : 7 hrs. 0 min.
SOUNDNESS :—Neat pats.
Air test O.K. Normal water test O.K.
Steam test O.K. Boiling water test O.K.
TENSILE STRENGTH :—Briquettes one sq. in. section.

	Neat			1:3 Sand	
Age	24 Hrs.	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	8	8
Average Strength ...	267	636	717	230	298

COMPRESSIVE STRENGTH :—Pounds per sq. in. Two inch cubes.

	Neat		1:3 Sand	
Age	7 Days	28 Days	7 Days	28 Days
No. of Tests	4	4	4	4
Average Strength ...	8070	9460	1750	2790

*Heated sample

CHEMICAL ANALYSIS :—SiO_2 18.58 per cent. MgO 1.68 per cent. SO_3 1.37 per cent.

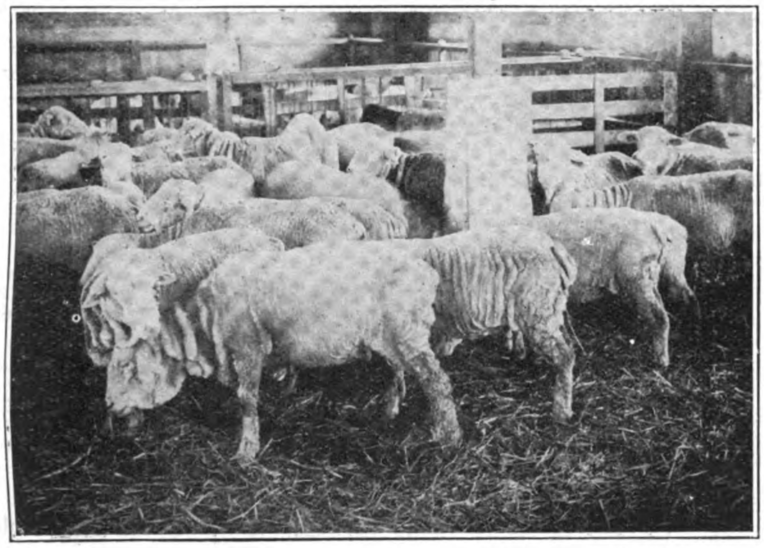
*Heated sample.

Art of Making Cloisonne Being Rehabilitated

Cloisonne ware was originally made for and used exclusively by the imperial family, the general public knowing little about it, and in the course of time cloisonne manufacturing became a lost art, says a recent government bulletin from China, giving a resume of the decline and rehabilitaion of this industry.

The making of cloisonne in Peking dates back to the time of the Ming dynasty. Its name in Chinese, Ching Tai Lan or Ching Tai Blue, is held to suggest that cloisonne ware first made its appearance in Peking during the reign of Emperor Ching Tai, of the Ming dynasty—1450-1456. Restricted to the use of the imperial family, for whom it was specially made, in time practically no new cloisone was made.

In the latter part of the eighteenth century the Emperor Chine Lung, of the late Tsing dynasty issued an edict permitting the people to manufacture this hitherto forbidden ware, and a sudden revival in the art resulted. The work of the Chien Lung period fell into three broad classes, those with gold, silver or copper for their foundation and partition. Some of the finest pieces were of pure gold, not only the structure of the actual vase or article, but also the metal partitions or wires, laid on the ware to form figures and designs to be filled in with the Enamel, were likewise of fine gold. The silver and sopper cloisonne were made in the same manner but of cheaper metals. The pigments and the enamel used in the manufacture of cloisonne were procured from certain mines in the country.



Imported Southdown sheep in the pens of the Kungchu-Ging Experiment Station of the S. M. R.

The Chinese Wool Industry

Transportation a Great Problem in Disposing of Fleece Raised in Remote Regions

IN 1922 China exported some 8,077,600-lb. of camels' hair, 67,679,000-lb. of sheep wool, and 2,034,400-lb. of goat hair. Of the wool exported 62,523,000-lb. went to the United States. The total amount produced is not obtainable.

Of the total shipments of China wool in 1922, 57,848,100-lb. were exported through Tientsin. Of the wool that comes into this port, roughly speaking, 50 per cent. is from Tsinghai and Kansu, 15 per cent. from Shansi and Shensi, 25 per cent. from Mongolia and 10 per cent. from Chihli and Shantung.

The development of the wool industry in China faces three very important problems : Producing the wool clean and free from impurities, such as sand, dirt and moisture ; improving the breed of the sheep ; and delivering the wool to market at a reasonable transportation charge.

There are a few hand presses for baling wool in several places in the interior, and washing, drying and packing plants are located in Shihisuitzu, Kalgan and Chungking, but these plants cannot begin to handle all the wool produced, even in the provinces in which they are located. Therefore, a very large amount of dirt and other foreign matter contained in the wool is carried to the seaboard, and, with the high transportation and native shipping charges, it is really surprising that wool can be delivered to tide water at a price which will find a market. The cost of packing, cleaning, transportation, and transit tax is nearly 60 per cent. of the initial cost of the wool at the source of supply or point of production or collection.

The transportation of wool into Hsining from Tsinghai is probably the most interesting problem. The wool is twisted into a rope of over 2-in. in diameter, while still wet, to prevent it from blowing away, is then dried and tied with goat hair ropes into packages weighing 175-lb. to 200-lb. It is then ready to be shipped to Kalgan. If there is an immediate demand for wool it is sent by camel either to Fengchen or Kalgan, which takes about 50 days. If there is no great rush it is held and floated down the Yellow river in the spring and autumn on rafts made of sheep or cattle hides. This method is both quicker, taking only about 30 days, and cheaper, but these advantages are outweighed by the danger of the wool becoming wet or discolored if packed air-tight. Therefore, unless the market demands an immediate supply, the slower and more expensive way is more often the cheaper in the end.

Transportation to markets in Shantung has the advantage of the railways and the Grand canal, and charges are not quite so high. This wool is usually brought into the collection centres in bags or tied up with mats, and will average from 160-lb. to 200-lb. per package.

In Eastern Mongolia, with its principal distributing point at Chihfeng and Dalianor, the wool comes packed in hemp bags tied with ropes and is sent either to Kalgan or Chinchow, the distance being about equal. As the Chinchow district is very mountainous the wool goes entirely by pack animal, each animal carrying about 320-lb., with the cost averaging 3.50 taels per animal for the trip. Between Dalianor and Kalgan carts drawn by cattle are used, each cart carrying approximately 525-lb. The cost per cart for the distance of 470 *li* (175 miles) is about 3.00 taels. From Sining, an important trading centre, to Kalgan, the transportation charge is 41 per cent. of the initial cost of the wool at the source of supply.

Therefore, it may be seen that the export trade of China in wool is suffering from lack of cheap transportation, and that all of China's produce which comes to seaboard from any distance in the interior is operating under the same severe handicaps. This, coupled with the fact that the quality of wool is the same as it has always been, and that no effort has been made to improve the wool through breeding, makes the growth of the wool trade of China quite remarkable. In the province of Yunnan there is an experiment being tried out by the French with some imported rams with the idea of sending the improved wool back to Ffance. In the province of Honan, the first effort on the part of native stock raisers to improve their stock is being made. The only experiment on any scale is now being tried out by the Japanese in Manchuria. They have imported merino, Southdown and Shropshire rams to cross with the native sheep, and have given themselves 20 years to work out their plans, claiming that the results so far have fully justified their hopes in ultimate success.

Japan Welcomes Opportunity to Electrify

AN interesting and highly significant aftermath of the terrible Japanese earthquake is to be recognized in an order just placed with an American firm for an unusually large quantity of portable electrical household air-heaters.

The ill wind that blew such disaster to Nippon in September apparently carried with it the germ of a happier order of things. The Japanese, ever quick to grasp opportunity, immediately and methodically set about the gigantic task of reconstruction—which involved first the caring for refugees.

Having in mind the remarkable part played by electricity through radio during the holocaust—thanks to which the outside world was rushing succor within twenty-four hours—the Japanese authorities began at once to enlist the aid of this powerful friend of humanity. It became evident that much of the fire damage following the earthquake resulted from the national habit of using *hibachi*, or small charcoal fire pots, which from time immemorial have supplied the frugal Japanese householder with heat and comfort.

Japan may yet have to thank this combination of glowing coal pots and paper walls for what is perhaps the most significant advancement in her national development—the wider use of electrical household devices by a people who are steeped in tradition and have followed the footsteps of their ancestors for year after year. It is just this quality of faithfulness that will so firmly establish a wider use of electricity in Japan once the people have had more opportunity of learning about it—and it is just this opportunity that the authorities are so wisely giving them during the trying period of reconstruction, when all machinery and apparatus installed must be of the highest quality and able to stand up under most unusual conditions.

The International General Electric Company of New York, at the request of the Japanese, is equipping house after house and barrack after barrack with light, heat and power—the germs of Western civilization. Springing up among the blackened ruins are row upon row of sanitary emergency quarters, carefully wired for electricity by judicious authorities, who have already laid out a vast scheme of electrical development the practicability of which will first be tested in miniature over a period of months, before building permits for permanent construction are issued.

From present indications America will have to look to her laurels as Japan apparently intends to electrify on an intensive scale never before undertaken by an entire nation and based on an ambitious scheme of intelligent national development which will call into use a great amount of potential electrical power.

II.—Petroleum Production and Trade of the Dutch East Indies

(Concluded from March Issue).

AT the present time there are 10 refineries in the Dutch East Indies. These are located as follows: One in Borneo, four in Java, four in Sumatra, and a small topping plant at Boela Bay on the island of Ceram, one of the Moluccas.

Borneo

At Balikpapan, on the east coast of Borneo, is located the largest refinery in the Dutch East Indies. Its daily capacity is well over 15,000 barrels of crude, and it handles approximately 5,000,000 barrels of oil annually, or about six-tenths of 1 per cent. of the world's total production. The total crude storage here is placed at 3,000,000 barrels. This plant is the property of the Bataafsche Petroleum Maatschappij, a subsidiary of the Royal Dutch-Shell. The oil is received at the refinery through pipe lines from the various parts of the Koetei field. The longest of these is a 5-in. line to the Sanga-Sanga wells, 65 miles distant.

The refining methods used are quite modern, although they hardly measure up to the standard processes followed in America. The crudes obtained from the different horizons of the field vary from a light oil of 0.84 specific gravity to heavy asphaltic grades up to 0.96 specific gravity, so practically all petroleum products from light distillates to asphalt and dyestuff bases are produced. A sulphuric-acid plant it also run in conjunction with the factory. The benzene and gasoline manufactures, amounting to over 50,000,000 gallons annually, is of such excellent quality that it does not require a sulphuric-acid treatment before it is marketed. Most of this product goes into the export trade, there being a good demand for it, especially in Europe and other countries of the Far East, except British India.

Balikpapan, the great oil-refining centre in Borneo

By the adoption of the Edeleanuan process of washing kerosene with sulphuric acid (H_2SO_4) to free it of tarry products, the Balikpapan plant is now producing annually over 25,000,000 gallons of high-grade kerosene, which finds a ready market throughout the Orient. A late press report mentions that the kerosene unit at Balikpapan is to be enlarged at a cost of $1,600,000.

Some of the Borneo crudes from the Koetei field yield a very high-grade paraffin, and consequently the product of the Balikpapan plant is well known in world commerce. All commercial grades of paraffin are manufactured, ranging from 125° to 140° F. melting point. The paraffin exports from this point totaled over 42,000,000 pounds in 1921, most of it being shipped to the United States, China, Japan, and the Netherlands. Until recently there was a large candle factory at Balikpapan, which was dismantled and moved to Shanghai because labor is more plentiful in China and, furthermore, that country is the principal market for these candles. Balikpapan shipped more than 8,600,000 pounds of candles in 1921, China taking nearly 6,600,000 pounds of this quantity.

Some of the heavier oils from the Koetei pools refine into fair grades of lubricating oils. The final products do not compare with American brands, but as a result of constant laboratory researches and the adoption of advanced refinery technique the quality of these oils has been greatly improved wthin the last few years. About 2,000,000 gallons of lubricating oil were exported in 1921, most of it going to Singapore for re-distribution.

One of the largest fuel-oil stations in the Orient is maintained at Balikpapan in connection with the refinery. There is storage capacity for 365,000 barrels and facilities for bunkering vessels within a few hours. Official statistics for 1921 show an export business of over 1,400,000 barrels of fuel oil for this one point.

On Tarakan Island, off the northeast coast of Borneo, there is a plant for preparing the crude of this field for fuel oil. A simple process is used for removing any sand or water, after which it is ready as a bunkering oil without further refining. There is storage on Tarakan Island for about 860,000 barrels of crude and 560,000 barrels of fuel oil. Over 4,000,000 barrels of crude and fuel oil were shipped from here during 1921, about half of this amount being credited to Japan.

Java

The Dordtsche Petroleum Maatschappij, subsidiary of the Bataafsche Co., has two refineries in east Java. One is at Wonokromo, just outside of the port of Soerabaya, and the second is at Tjepoe in the Rembang residency, west of Semarang. The Wonokromo factory, established about 1890, can handle 800 barrels a day, although lack of a constant supply of oil generally forces this plant to run at less than full capacity. The crude worked here comes by tank cars from the several concessions in Soerabaya Residency, although there is a small pipe line to a well in the immediate neighborhood. Wonokromo has storage tanks for 100,000 barrels of crude in addition to refined-oil tankage.

A low grade of kerosene, all of which is marketed locally, is the chief product of this factory. Lubricating oils also are made and sold to the Java sugar and rice mills and to the motor trade. However, these locally made lubricants are not very popular, because of their poor quality. Some little gasoline is manufactured, but it has a bad odor, and is consequently difficult to sell unless specially treated or mixed with better grades.

Distribution of products from Wonokromo is chiefly by the State railroad, although considerable quantities of kerosene are shipped to the interior by small river barges on the Kali or River Brantas. Native-owned ox-carts, which load up to forty 5-gallon tins, likewise do a good freighting business in illuminating oil in competition with the railroad.

The factory at Tjepoe, a property of the Dordtsche Petroleum Maatschappij subsidiary of the Bataafsche Co., was first established in 1894. It is a complete plant with a daily capacity of 2,000 barrels, although its run depends upon the amount of crude available. This supply comes from the concessions in Rembang and Semarang residencies and is conveyed to the refinery by several short 6-inch pipe lines. Storage tanks are maintained for about 660,000 barrels of crude, besides smaller tanks for refined or partially refined products.

The Tjepoe gasoline and kerosene, all of which is sold locally, is of very good quality, although hardly comparable with the output

of the Sumatran and Borneo units. Shipments of these products are largely by railroad, but there is considerable distribution by prauw or flat-bottomed barges on the Begawan and Solo Rivers. The figure showing the yearly amount of kerosene made at Tjepoe is not available, but the two units Tjepoe and Wonokromo produce together about 20,000,000 gallons. As the crude obtained here carries a high-grade paraffin, especially suitable for candles, there is a small candle plant run in connection with the refinery. The candles manufactured have a high melting point and are therefore more desirable for use in the tropics. The entire output is marketed locally except for a few tons that find their way into the export trade.

The Algemeene Petroleum Compagnie, and independent company owning the Klantoeng-Sodjomerto concession in the Semarang residency, has a small refinery at Klantoeng. A little kerosene is made and sold to the natives. The residue is used as fuel at the plant or sold locally when there is a surplus. About 2,600 barrels were handled in 1920.

The Nederlandsch Koloniale Petroleum Maatschappij, a subsidiary of the Standard Oil Co. of New Jersey, has but recently constructed a small refinery at Kapoean in the Rembang residency. The capacity of this plant is 250 barrels daily, and it will take care of the crude from this company's Petak and Tremboel concessions, which produced 22,081 and 4,044 barrels, respectively, in 1920.

Sumatra

The four refineries in Sumatra are located at Perlak, in the Atjeh residency, at Pangkalon Brandan, in the Oostkust residency, at Pladjoe, and at Bagoeskoening, both of the latter plants being just below Palembang on the Moesi River.

At Perlak the Bataafsche Co. owns a complete factory for the distillation and refining of gasoline. Storage is provided here for 50,000 barrels of crude and up to 15,000 barrels of refined products. This plant is connected with the refinery at Pangkalan Brandan, a distance of about 76 miles, by a 6-in. as well as a 10-in. pipe line.

The refinery at Pangkalan Brandan, property of the Bataafsche Petroleum Maatschappij, is the largest in Sumatra. It is on the Babalan River about 13 miles from Pangkalan Susu, the port for the refinery. The Pangkalan Brandan factory was built in 1892 and has been enlarged from time to time until at present it can handle 10,000 barrels of crude daily. There is storage for over 1,000,000 barrels of crude and 50,000 barrels of fuel oil, besides tankage for refined products. In addition to the pipe lines between Perlak and Pangkalan Brandan as mentioned above, there are four lines, a 10-in., two 6-in., and a 4-in., between the refinery and the terminal at Pangkalan Susu, where there is a can factory (capacity 12,000 tins daily, filling plant, and storage for 300,000 gallons.

The two refineries in the southern Sumatra field are at Pladjoe and at Bagoeskoening, just below Palembang on the Moesi River. The Bataafsche Co. operates these plants, and they constitute a complete unit, with a daily capacity of 5,000 barrels, for the manufacture of practically all petroleum products, especially benzine, gasoline, kerosene, lubricating oils, and greases. The crude is either piped to the refiners or transported in oil barges that bring oil down the Moesi River from Kajoe, and 8-in. pipe-line terminus from the North Babot field. Two 4-in. lines, 87 miles long, connect the Pladjoe factory with the Kampong Minjak field, and still another line 141 miles long brings oil from the Melamoen district. Crude storage is available up to 1,300,000 barrels.

The output of these retineries goes largely into the export trade, there being a good demand for the various products in the Orient, Europe, Africa, and Australia. The following quantities were exported from Palembang during 1921: Kerosene, 22,000,000, gallons; benzine and gasoline, 38,000,000 gallons; lubricating oils 660,000 gallons; and lubricating grease, 389,000 pounds, besides, small quantities of crude, fuel oil, and asphalt. Products intended for local consumption are distributed largely by native craft and steamers on the Moesi River and its several tributaries. Shipments to the other islands of the colony are handled by the Nederlandisch Indische Tankboot Maatschappij, the interisland transportation company operated by the Royal Dutch.

The crude from the northern Sumatran fields is very rich in light distillates, and yields 30 per cent. or more of high-grade gasoline in addition to 40 per cent. or more of excellent kerosene. No recent figures are available that show the gasoline and kerosene output of the two refineries in northern Sumatra, but an estimate for 1921 based on the crude available places the benzine at about 40,000,000 gallons and the kerosene at 50,000,000 gallons. A large part of these north Sumatran products is sold in the colony, principally in Java. The exports, principally to the other Asiatic countries, amounted to approximately 51,000,000 gallons* of gasoline and benzine and 40,000,000 gallons* of kerosene during the same year.

Ceram

There is a small topping plant on Boela Bay, on the northeastern coast of Ceram, an island in the Amboina residency. This plant was formerly the property of the Rembang Industrie Maatschappij and was located at Wadoe, a station on the Netherlands Indian Railroad between Semarang and Soerabaya. The property was taken over by the Dordtsche Petroleum Maatschappij in 1918, the refinery being dismantled and set up again at Boela Bay in order to take care of the Ceram production. The crude of this field, which approximated a third of a million barrels in 1921, is topped for the lighter products, which are then sent to Balikpapan for the final refining processes, the residue being sold at the small fueling station maintained at Boela Bay.

Petroleum Market

Annual Consumption

The output data of the refineries in the Dutch East Indies are not available in a form to give a basis for a consumption calculation by products. Such refinery information is generally published after it is several years old and then only for a portion of the refinery units, so that it is impossible to gain a very definite idea of the amounts of kerosene, gasoline, lubricating oil, etc., produced locally. However, some idea of the market here can be gained by considering the consumption formula of "production plus imports minus exports." The latest totals available, those for 1921, show a local production of 17,000,000 barrels, or 714,000,000 gallons. The imports for the same period were 33,000,000 gallons, exclusive of grease, asphalt, and other solid products, while the exports totaled 473,000,000 gallons. The net amount, 274,000,000 gallons, represents the 1921 consumption of liquid petroleum products, which is approximately 5.5 gallons per capital for the 50,000,000 population. It may be stated that more than 70 per cent. of the total is consumed in the island of Java alone, if one bases an estimate on the percentage of the total population represented there, but actual figures, if available, would probably show even a slightly higher rate, as the Japanese are in much closer touch with the white race and are consequently larger users of mineral oils than the natives of Sumatra, Borneo, and the other smaller islands of the archipelago.

The imported products, largely kerosene and lubricating oils from the United States, represented about 9.5 per cent. of the consumption during 1914, about 9.6 per cent. in 1920 and 12 per cent. in 1921. (The export and import of paraffin, grease, asphalt and other solid products are not taken into consideration.)

Marketing Companies

There are three marketing companies doing business in the Dutch East Indies. They are the Dordtsche Petroleum Maatschappij, the Standard Oil Co. of New York, and the Vacuum Oil Co.

The Dordtsche Petroleum Maatschappij was first established at The Hague in 1887, with a capital of $30,000, which was increased to $140,000 in 1890. This company made steady progress and gradually obtained control of the Java production, which it refined in its plants at Wonokromo and Tjepoe, Java, and sold on the local market. In 1911 the Dordtsche company was taken over by the Bataafsche Petroleum Maatschappij of the Royal Dutch-Shell and was made the marketing company of this group in the entire Dutch Indies. Additional capital was authorized until it now stands at $800,000.

The head office of this company is at The Hague, with Sir Henri W. A. Deterding, director general, as the chief executive. The production in Java and the marketing in the Indies are directed from the main office in Soerabaya, with J. Th. Vouck, jr., as general manager.

* These totals includes exports from Poeloe Samboo, an oil installation off Singapore, where products of the northern Sumatran refineries are stored and distributed. Poeloe Samboe also re-exports some products originally received from British Borneo and Persia.

Branch offices under Dutch managers are maintained at all important ports and large marketing centres, so that this company is well organized to hold its share of the petroleum-product market, of which it controls about three-quarters of the business.

Kerosene was the first American mineral-oil product to be sold in the Orient. Its introduction into the Dutch Indies came about by the selling at auction at the various ports of cago lots of case kerosene. These were generally bid in by wealthy Chinese, who distributed this oil among the smaller dealers. An American company has all the business in imported kerosene, except for small quantities from British Borneo and Persia, brought in by the Bataafsche Co. The market in imported lubricating products is divided between the two American oil companies, one of which deals solely in this product. Case gasoline was formerly imported and sold by one of the American oil companies, but this practice was discontinued during the world war.

Government Policy Toward Companies

The Dutch colonial government is impartial in its policy toward the several marketing companies. Foreign companies receive the same consideration in all matters with one possible exception, which is that the Dutch company is given a 5 per cent. preferential in bids submitted for the supply of mineral-oil products to the government.

Marketing Methods

The marketing companies follow two different plans for the distribution of products to the consumer. One method covers the disposal of kerosene and gasoline, and the second is used in the lubricating oil and grease trade.

Kerosene and Gasoline

Kerosene and gasoline, or motor fuel, are sold through Chinese* bonded agents on a commission basis. These men are under contract to sell only the brands of their respective companies, and they receive a small commission on all quantities actually sold. Subagents are often appointed at minor distributing centres in order to push sales and to give better service to the trade. The transactions of these subagents are guaranteed by the head agent of the district. They receive a small selling commission, which is generally about half of the regular fee.

The oil companies protect themselves against financial loss by requiring a cash bond from the agent upon his appointment. This money, varying from a few hundred to several thousands of guilders according to the volume of stocks to be carried, is deposited with the company and a nominal amount of interest is allowed the agent, payable semi-annually. In many cases the agents give a credit mortgage on real estate in lieu of cash deposited with the oil company, and in some very exceptional instances European firms, when appointed as distributing agents, are allowed to give their personal bond promising the payment of all funds due the oil company. This agreement takes the place of the cash or credit mortgage bond of the Chinese or native agent. The agent is responsible for any credit that he may extend to his customers, so that the oil companies are absolutely protected against loss through bad debts.

The marketing companies provide storage for the agent, and his stocks are delivered to him with all transportation charges prepaid. Additional allowances are made to cover unloading costs, and under special circumstances delivery charges to customers may be credited by the agent. All warehouse leakage is for the agent's account. The agents sell at wholesale prices fixed by the oil companies, and deliveries to customers are generally made ex warehouse. The buyers, who are mostly small shopkeepers, resell at their own price, but competition tends to keep this down to within a few cents of the wholesale cost plus receiving charges. The natives buy their daily supply of lamp oil directly from the small shopkeeper or peddler in lots of a liter or less, according to the family budget.

Within recent years the oil companies have maintained field staff of traveling inspectors. These men are generally young Dutchmen or Americans, assisted by Chinese. It is the business of these men to be in close contact with the market and prevailing economic conditions in their respective territories, so that they may assist and advise the Chinese agents and generally promote the sale of their company's brands.

The locally made kerosene and gasoline reach the market in what are termed "naked tins," or the ordinary square 5-gallon petroleum cans which are the standard packing in foreign commerce. In recent years gasoline in 2-gallon drums has been introduced for the convenience of the trade. The American brands are imported in pine cases, with two 5 gallon tins, or a unit of 10 American gallons, to the case. The tinned oil is generally stripped of its case at the importing point and shipped to the up-country markets without this protection. The empty cases are sold separately and are in great demand for packing boxes in local industries. The empty tins also command a good price. These are seldom handled by the oil companies but are brought in by the Chinese or natives and are used in place of sheet tin for manufacturing different articles, or as containers for vegetable oils or other liquids.

Very recently the American company in the field has established can-making and filling plants for kerosene at several points where bulk oil is imported and filled for this market.

The Royal Dutch brands sold in the Dutch East Indies are Crown gasoline and Crown, Rising Sun, Key, and D.P.M.—Java kerosenes. The Crown is the best of these ; Rising Sun and Key are intermediate grades ; while the D.P.M.—Java is the cheapest.

Lubricating Oil

Lubricating oils and greases are marketed somewhat differently from kerosene. They are sold to the automobile owner through regularly appointed agents, generally dealers in motor accessories who buy their stocks outright from the oil companies. They agree to handle only the brands of the company they represent and to sell at prices as fixed by the oil companies.

The sugar-mill, rice-mill, and other factory trade in lubricants is eagerly sought by the different oil companies, and the competition is rather lively. Traveling salesmen, generally Dutchmen with some knowledge of lubricating engineering, visit the mills and factories periodically for the purpose of taking orders for the season's supply of lubricating oils and greases. These men work on a commission, or a salary and commission, basis.

Contracts for the supply of mineral lubricants to the railroad and tramway companies are generally made with the successful bidder for this trade. Sealed bids are requested for quantities that must follow the desired specifications, the tenders being handled precisely as they would be in this country.

Lubricating oils and greases intended for the mills, factories, and transportation lines are imported in 50-gallon wooden barrels. The locally made brands are packed either in wooden barrels or steel drums. Lubricating oil for the motor trade is handled in tins from 1 to 5 gallons in size, while greases appear in packages up to 50 pounds each.

The Royal Dutch lubricating products are sold under the trade or brand name of D.P.M.—the initials of the Dordtsche Petroleum Maatschappij, the marketing company of the group. The American brands are most in demand, except where price and not quality is the main consideration.

Marketing Conditions

Importing and Distribution Points

Outside of the refineries already described, the several ports are the large distributing centres. In order of gallonage imported, the more important of these are Poeloe Samboe, Batavia, Soerabaya, Semarang, and Makassar.

On Poeloe Samboe, a small Dutch island of the Riouw Archipelago, within 7 miles of Singapore, the Bataafsche Petroleum Maatschappij maintains a very important storage and distributing centre. Surplus oil from the Pangkalan Brandan refinery is shipped here for storage and reshipment to other points. This place is also an importing station for kerosene, benzine, gasoline, and fuel oil from British Borneo and Persia. A fuel-oil bunkering station with a 63,000-barrel capacity is located there in addition to the other storage facilities. On Poeloe Bukom, another small Dutch island in this group, there is additional storage as well as a fuel-oil bunkering station. The imports received at Poeloe Samboe in 1921 were 4,800,000 gallons of kerosene, most of it from Persia ;

* Occasionally Europeans, Arabs, or natives are made agents when local conditions warrants such an appointment.

3,600,000 gallons of benzine and gasoline from British Borneo; 6,100,000 gallons of fuel oil, largely from British Borneo; besides smaller quantities of lubricating oil, grease, and turpine, a mineral oil substitute for turpentine.

At Batavia, Java, the petroleum installations are located 10 miles distant, at Tandjong-Priok, the port of the city. Here both the Dutch and American companies maintain tankage and warehouses for package goods. One American company has a can factory and filling plant for the packing of imported kerosene. Distribution to the interior is principally by rail shipments over the government-owned railroad lines, though considerable quantities are moved to near-by points in oxcarts. Batavia (Tandjong-Priok) is the chief receiving port in Java for kerosene, lubricating oil, and grease. The quantities imported in 1921 were approximately 3,000,000 gallons of kerosene, 1,400,000 gallons of lubricating oil, and 15,000 pounds of lubricating grease, besides smaller quantities of other petroleum products. Practically all these shipments originated in America.

Soerabaya, known as the sugar port of Java, is the second largest importing centre for petroleum products. A new petroleum harbor has been completed there within the last few years. All facilities are available for alongside unloading of both bulk and package petroleum. The oil companies have acquired locations at the new harbor site, and have built extensive bulk tankage and case-goods warehouses. An American company has facilities here for can manufacturing and filling of imported bulk kerosene. Distribution to the interior is largely by freight cars over the government and Netherlands Indian railroads. Ox-carts, as well as flat-bottomed boats on the coast and the Brantas and Solo Rivers, do considerable freighting of kerosene to the smaller markets.

The imports at Soerabaya of petroleum products for 1921 were 1,200,000 gallons of kerosene, 1,500,000 gallons of lubricating oil, and 422,000 pounds of grease, besides smaller quantities of vaseline, candles, and asphalt, practically all these commodities coming from the United States.

Semarang, on the north-central coast of Java, is another important receiving port for mineral oils. The petroleum companies have large warehouses here for storage and the distribution of their products to this part of the island. Shipments to interior points are made over the N. I. S., a privately owned railway. The 1921 imports totaled 1,300,000 gallons of kerosene, 2,400,000 gallons of lubricating oil, 268,000 pounds of grease, and smaller quantities of ther petroleum derivatives, America being the principal source of supply.

Makassar, the chief port of Celebes, is the importing center for all the southern portion of that island, as well as for other small islands in the vicinity. There are extensive warehouses here for case goods, but no tankage except for fuel oil at the bunkering station maintained here by the Royal Dutch Co. All the distribution from this point, with the exception of some kerosene that reaches the nearby points in oxcarts, is by boat—either native prauws or steamers of the Koninklijke Paketvaart Maatschappij or the Nederlandsch Indische Tankboot Maatschappij. The quantities of petroleum products received during 1921 were 1,000,000 gallons of kerosene, 22,000 gallons of lubricating oil, and 64,000 pounds of grease, as well as small amounts of gasoline and benzine.

In addition to the larger places mentioned above, there are importing and distributing warehouses at Padang, Sibolga, Medan, and Sabang, in Sumatra. At Medan and Sabang there is tankage as well, the latter port being a small fuel-oil bunkering station. smaller importing points of Java are Indramajoe, Cheribon, Tegal, Pekalongan, Pasoeroean, and Panaroekan on the north coast, Banjoewanji on the eastern end of the island, and Tjilatjap on the south coast. Besides the usual warehouses, one of the oil companies, the Dordtsche Petroleum Maatschappij, has tankage and a filling plant for kerosene at Tjilatjap. The railraods are the chief means of distribution from all these places. Boeleleng, on the island of Bali, Menado and Gorontalo in Celebes, Tenate, Amboina, and Banda Neira in the Moluccas, and Pontianak and Bandjermasin in Borneo are also minor receiving and distributing points. Most of the oil is resnipped in small boats or steamers from these ports.

Principal Exporting Ports

In 1914 the Dutch East Indies exported 265,000,000 gallons of liquid products, in addition to 27,000,000 pounds of solids valued at a total of $55,000,000. Official figures for 1921, the latest available, show that this trade has increased steadily, the totals in this year being 473,000,000 gallons of liquids and 101,000,000 pounds of solids, representing a total value of $90,000,000.

The important exporting places are Balikpapan, Pangkalan, Brandan, and Palembang, where the larger Royal Dutch refineries are located. In addition to these, Tandjong Seilor, the port that clears the crude and fuel oil from the Tarakan field, and Poeloe Samboe, the storage installation near Singapore which handles the surplus of the Pangkalan Brandan refinery, are points that ship large quantities of petroleum.

During 1921, Tandjong Seilor exported more in volume or gallonage than any of the other ports, the quantity amounting to 170,000,000 gallons of crude and fuel oil; about hlf of this was credited to Japan, a country that buys large quantities of these oils from the Dutch Indies. Singapore and Hongkong also received large quantities from the same source.

During that year Balikpapan shipped 138,000,000 gallons of liquids in addition to 90,000,000 pounds of solids. The 23,000,000 gallons of kerosene exported from here went to Singapore for reshipment to the Straits Settlements and to China. Singapore and Gibralter received the larger share of the 53,000,000 gallons of benzine and gasoline shipped. Balikpapan fuel oil (59,000,000 gallons) is credited chiefly to Singapore, British Indiaz, Suez and Hongkong, in the order of the quantities received. Slightly less than 2,000,000 gallons of lubricating oil made at this Borneo refinery were sent to Singapore for further redistribution. All the paraffin and candles exported from the Dutch East Indies, with the exception of small amounts from the Tjepoe factory, are made and distributed from Balikpapan. The 1921 totals are 42,000,000 pounds of paraffin and 8,600,000 pounds of candles. Practically all of the paraffin was divided almost equally among Japan, China, and the United States, while China was the largest buyer of the candles.

In 1921 Poeloe Samboe, the Dutch storage installation off Singapore, was the third port from a gallonage or volume standpoint. The quantities cleared to foreign countries were 30,000,000 gallons of kerosene, 46,000,000 gallons of benzine and gasoline, 4,700,000 gallons of fuel oil, 470,000 gallons of lubricating oil, 323, 000 pounds of grease, 180,000 pounds of candles, and 225 tons of asphalt. The larger share of these products was made in the refinery at Pangkalan Brandan, Sumatra, and sent to Poeloe Samboe for storage and redistribution.

Palembang is the fourth port in these islands for the export of petroleum products. In 1921 the refineries located there shipped the following quantities to foreign countries: Kerosene, 22,000,000 gallons; benzine and gasoline, 38,000,000 gallons; fuel oil, 2,000,-000 gallons; lubricating oil, 660,000 gallons; grease, 389,000 pounds; and asphalt, 634 tons. The kerosene from here goes largely to Asiatic countries, the Straits Settlements, and China being the best markets. The exported gasoline, being of excellent quality, is in good demand in European countries.

The refinery at Pangkalan Brandan exports only kerosene, benzine, gasoline, and fuel oil. The 1921 figures are: Kerosene, 10,000,000 gallons; benzine and gasoline, 5,000,000 gallons; and fuel oil, 2,000,000 gallons.

All petroleum products shipped from the Dutch East Indies are subject to an export duty. They are divided into two classes and are rated as follows: (*a*) Kerosene and all by-products not mentioned under (*b*), 7.50 guilders per 1,000 kilos; (*b*) liquid fuel, residue, 4 solar oil, filter-press oil, lubricating oil, greases, batching oil, pitch, and wax oil, $1.50 guilders per 1,000 kilos.

In computing quantities, gasoline of 61° Baume gravity at 60° F. is taken as 37.9 cases or units of two 5-gallon tins to the metric ton of 2,204.6 pounds. Kerosene is taken as 65 pounds net per case or unit of two 5-gallon tins. Lubricating oil at 7½ pounds to the American gallon is taken as 294 gallons to the metric ton of 2,204.6 pounds.

Within the last year there has been a good deal of propaganda, especially on behalf of the Royal Dutch Co., to have the export tax on petroleum products removed, as this levy is considered burdensome and a restraint on the development of the export trade in petroleum. The Dutch colonial government cannot afford to do without the money derived in this way, so various plans have been proposed for the collecting of revenue from other sources, such as a refinery tax on petroleum products or an export tax on other commodities.

Sarawak Oil Fields

Paper Read by Hon. T. G. Cochrane, D.S.O., Before the Royal Society of Arts

THE production of petroleum in Sarawak in 1923 was about 560,000 tons, and though this is not large in comparison with, say, California or Mexico, it has this point of special interest and importance—that it is produced within the empire. The production from Sarawak for 1918 was 80,000 tons, making it a very bad fifth in the list of producing countries within the empire. To-day Sarawak can claim to be by no means a bad second—the lead, of course, still being held by the great oilfields of Burma, the work of many years of development. A series of more or less active seepages, located a little inland from the original Miri village, were exploited in a primitive way by the Miri Malays. The procedure was to dig pits about three feet deep in the zone of seepages. Being in swampy ground these pits filled with water on the surface of which the oil floated. This oil was skimmed off by the natives using gourds or cocoanut shells, and burnt for lighting their huts in very primitive lamps, made from any convenient vessel, such as an empty tin, a small gourd or even a bottle, using a strip of cotton or other cloth to serve as a wick. The bituminous residue or asphalt which was found at the seepages (the result of evaporation and oxidation) was also used by the natives for caulking their dugouts.

Pioneer Work

Between August and December, in the year 1909, Dr. Erb carried out a rapid reconnaissance survey in the northern part of Sarawak, coveing some 400-500 miles, and was able to report the existence at Miri of a dome-shaped, unsymmetrical anticline, with a steep eastern flank and numerous oil shows. As a result the Anglo-Saxon Petroleum Company made an application to the Rajah of Sarawak—the late Sir Charles Brooke, G.C.M.G.—for a concession to exploit the oil resources of Sarawak. The Rajah in due course granted to the company a concession on terms which were fair and satisfactory to both parties. In February, 1910, Dr. Erb returned to Miri, and after further investigation of that area, fixed the location of the first well, and in March Mr. McAlpine, who is still at Miri, went to superintend the boring.

At this time there was no accommodation available at Miri, and all hands set to work to build shelters for the Chinese coolies, the Malays being billeted on the natives. It is pleasant to record that these pioneers of a new industry in Sarawak had a most friendly reception from the natives, and were given every help and encouragement by the Sarawak government officials. The rig irons, boilers, engines and drilling tools were dispatched from the Sanga Sanga field in the Dutch East Indies in charge of Mr. Souter, an English driller, and arrived at Miri early in May. The site for the first well was located about a mile from the landing place, 260-ft. above sea-level. The drilling boiler took 80 men with blocks and tackle three days to haul into position. Drilling commenced on August 10, using the wire line and poles method, which had proved very successful in the Dutch East Indies. Exactly two months later, on October 10 oil was struck at a depth of 447-ft., and the well produced 4 tons of water-free oil per day. It was then deepened slightly to 510-ft., from which level it produced 12 tons a day. The success of the first well, of course, necessitated its being shut in until storage could be erected. A second well was commenced in April, 1911. In September, Mr. H. Wyndham-Jones, the first general manager, arrived and took charge of the operations. He remained at Miri until 1920, when he was able to hand over to the present general manager, Major E. V. Benjamin, M.C., a vastly larger and more important enterprise than he had found nine years previously. The first steel storage tank of 4,500 tons capacity was completed in October and the production for the year was about 260 tons. On April 18, 1913, the first shipment of Sarawak oil was made in two lighters, which were towed away from the Miri River. The experiment was also tried later on of mooring a tanker off the Miri River to act as a floating storage tank. This, however, was not altogether a success, as the weather often made it impossible for a tanker to go alongside, and lighters had still to be used. In 1914 further successful wells were drilled.

The War Handicap

At the beginning of 1915, as was to be expected—and, indeed, down to the end of 1919—operations at Miri were much handicapped by shortage of materials and staff, and to an even greater extent by shortage of shipping and storage. Under these abnormal circumstances an abnormal course had to be adopted. Distillate had to be produced ; it was not wanted for war purposes, and the limited storage capacity was required for crude oil and liquid fuel. We have all heard, I suppose, how in pre-motor car days benzine, i.e., petrol, was regarded by oil producers as a dangerous and undesirable waste product at a refinery, and how in consequence it was burnt in huge quantities to get rid of it. The Sarawak distillate, however, did not share this fate, but instead, the novel plan, which originated in the fertile brain of the chairman of the company, was adopted of pumping it back again into the earth from which it had come. About 30,000 tons of distillate was pumped back, the pump pressure at times rising to over 100 pounds to the square inch. Later on, in 1919, when storage and shipping conditions had become more normal, these wells were pumped again, and I am pleased to say that it is estimated that about 14,000 tons of distillate was recovered in the form of a light crude. By the end of 1915 the condition of the 6-in. submarine pipe line had become so bad that it was decided to lay an 8-in. line at once.

Pipe Line Developments

The first 8-in. line was successfully launched in September, 1916. The length was 11,750-ft., giving a depth of water at the sea end of 28-ft. at low water spring tides. This line is still in use, and three further lines have since been laid.

It was, of course, obvious that sooner or later the refinery would have to be moved from Miri to Lutong, so as to be near the tank farm and sea-loading line, and the refinery was able to start up at Lutong in July, 1919.

The years 1919, 1920, 1921 were devoted mainly to what I may term the consolidation of the position already gained, and in building up the necessary resources in staff and materials to make possible the greatly increased production reached in 1922. Thus while 1919 showed an increase over the previous year of 13,000 tons, 1920 an increase of 60,000 tons, and 1921 an increase of 58,000 tons, the year 1922 was able to show the remarkable increase of 204,000 tons—more than twice the production for 1921. The year 1923 has again shown a very marked increase over 1922 of some 150,000 tons. Recent deep drilling to the south of the old field has given favorable results, so that a further extension of oil-bearing structure in that direction is anticipated. At Pujut a shallow field has been developed with wells from 300 to 400-ft. deep, which produce a natural fuel oil with no constituents boiling below 200 deg. C. This crude is pumped direct to fuel oil storage tanks, so that if the Lutong refinery was completely destroyed to-morrow a certain amount of fuel oil would still be available for naval or other purposes. To the south of the old Miri Field exploration wells drilled recently have given good results at over 2,000-ft., producing a crude oil with a higher percentage of light fractions than are obtained from other parts of the field.

Refinery at Lutong

The refinery at Lutong at present comprises two units working on the "Trumble" system of distilling oil by means of tubular stills, with a combined throughout per 24 hours of about 1,500 tons of crude oil, while a third Trumble unit is in course of erection. There is now a sufficient supply of gas from the field to enable the whole refinery to be run on gas instead of on fuel oil at night time, when the requirements of the field are low. The sea-loading lines at Lutong are the longest in the world.

In view of the larger size and consequently deeper draught of modern tank ships it was thought desirable to secure a depth of water at the loading terminal of not less than 35-ft. at low water. Soundings showed that to obtain this depth a length of about 14,500-ft. ($2\frac{3}{4}$ miles) would be required. The very great importance of making the most eleborate arrangements for control during the actual period of launching will be appreciated when it is remembered

(Continued on page 189).

The Fushun Oil Shale Deposits

300,000,000 Tons of Petroleum Awaiting Exploitation; S.M.R. Plans for a 2,000-Ton Extraction Plant to Cost Yen 6,000,000

AS the consumption of kerosene increases annually, effort is being turned to finding some way to produce petroleum from outside an oil field or petroleum well. A solution of coal or its liquidizing is one of the means. A low temperature dry distillation of coal is another. Then, fish oil or bean oil is also subjected to dry distillation. Fourthly, oil shale is also put through dry distillation.

(1) The solution of coal and its liquidizing still belong to an experimental stage.

(2) The low temperature dry distillation of coal has nearly advanced to a stage bordering on an industrially workable one, but so long as the market for the gas and colite put out from this process has not been fully exploited, the production of oil in a large quantity will be out of the question. By (3) the dry distillation of fish oil or bean oil, petroleum may be obtained to the extent of about 60 per cent. Still, the fish oil outputs of Japan are only about 20,000 tons a year. As to bean oil, 900,000 koku or 150,000 tons may be put out in Manchuria. However, it has important uses as an edible and an industrial material, making it impossible to make fuel therefrom on an economical footing.

Only, manufacture of petroleum from oil shale dates back 70 years in Great Britain, France, and elsewhere. In England, as much as 2,000,000 *koku* of petroleum of the same quality as natural petroleum in every respect is obtained from this source.

Therefore, if petroleum is to be sought outside a natural oil field, the dry distillation of oil shale is the only way to produce it at present.

The United States puts out 70 per cent. of the world's petroleum. According to a report of the geological institute of America, the aggregate oil reserve left is placed at 9,100,000,000 barrels which is expected to last not more than 20 years hence. Colorado and Utah and elsewhere have been attracting investments by enterprising capitalists, and in ten years' time, the oil shale industry might occupy the place of importance, that is now filled by natural petroleum mining.

In France and Austria, too, oil shale industry has been carried on from early times, and in recent years, factories have come to be founded in Esthonia, Sweden, Canada, etc.

Since shale oil promises to supplant petroleum in the not distant future, the powers, while running after new petroleum fields, are almost engrossed in looking for oil shale mines.

To date no oil shale deposit has been discovered in Japan proper. However, the Fushun Collieries owned by the S.M.R. Co. hoard one of the richest reserves in the world. Moreover, the results of latest investigations show that the Fushun shale is equal to any foreign product in point of quality. Favored with advantageous local conditions, the Fushun deposit can be operated on a most economic basis in peace time.

Oil Shale at Fushun

The oil shale of the Fushun Collieries exists in a thick seam of about 4,000-ft. over the coal seam. Its total reserve is placed at 5,500,000,000 tons. By dry distilling the shale, 5.5 per cent. of crude petroleum on an average may be had. At this rate, the total oil amount contained in the shale seam reaches about 300,000,000 tons, that is, 1,900,000,000 barrels being about one-fifth of the aggregate petroleum reserve of the United States amounting to 9,100,000,000 barrels. On this basis of calculation, the Fushun shale oil alone will be sufficient to supply Japan with her total annual wants of 6,000,000 barrels in petroleum for as long as 300 years.

Fushun shale cannot be said to have a high oil percentage, but its peculiar advantages consist of firstly, its existence in an excessively thick seam directly above the coal seam, at only a comparatively short depth from the surface ground; secondly, exceptionally low labour wages; thirdly, availability of fuel coal in an unlimited quantity and at a cheap price; fourthly, comparative plenitude of communications facilities; fifthly, abundance of water for industrial use. All these peculiar advantages work together to ensure an economic success to the oil shale industry at Fushun.

The reserves of the oil shale at Fushun Collieries, according to the various depths from the surface ground, may be roughly estimated as follows:

Oil shale reserve	Tons
Down to 100-ft. (underground)	252,000
Down to 200-ft.	505,000
,, 300 ,,	756,000
,, 500 ,,	1,223,000
,, 1,100 ,,	2,380,000
,, 2,000 ,,	4,151,000
,, 3,000 ,,	4,932,000
,, 4,500 ,,	5,477,000

The total shale amount estimated to be mined from the execution of the extensive open cut mining plan, is put about 500,000,000 tons. By dry distilling the annual outputs of between 5,000,000 tons and 10,000,000 tons for 25 years, shale oil of 385,000 tons or 2,310,000 koku of shale oil on an average may be obtained, which will still be somewhat more than the total petroleum outputs of Japan.

Supposing that the oil shale should be mined on a 100 years' programme down to the depth of 2,000-ft. underground, in connection with the oil shale industry, some 2,000,000 tons of crude petroleum might be had from the average annual outputs of 40,000,000 tons of oil shale.

The recent petroleum demand in Japan being 1,000,000 tons a year, the Fushun shale oil by itself would satisfy the entire needs of Japan for scores of years, even if her annual consumption might be doubled, or trebled.

The S.M.R. Co. proposes to begin with the utilization of the oil shale to be mined in the open cut mining zone, and then to take to a gradual extension of the industry as occasion require with the object of making Fushun the central source of supply of solid and liquid fuels to Japan.

As regard the industrial assets of Fushun oil shale, such specialists as Messrs. T. Suzuki, G. Katayama, K. Saito, and M. Akita, all in the service of the S.M.R. Co. then, took up each a line of study, but none of them has succeeded in fully ascertaining the real assets. The imperial navy despatched a few chemists specially on a like errand, which has met with no better results.

There may have been divers reasons for their failure, but none of them seems to have observed the existence of a wide difference in quality of oil shale according to distances from the surface ground. They are believed to have gathered the specimens of shale from near the coal seam in the Pits.

As the open cut mining operations progressed, Mr. K. Akabane (now director of the S.M.R. Co. and the author of the present article), happened to meet Admiral Nagasato, director of the Munitions bureau of the imperial navy, and Vice-Minister Ide, of navy, in June, 1922. As a result of the interview, Mr. Akabane became strongly impressed with the importance of the independence of petroleum supply for Japan, and suggested the organization of a commission for the study of Fushun oil shale. The investigation was pushed forward steadily. About a dozen diamond borings were executed in the open cut zone, Fushun, and as an upshot, the oil percentage contained in the shale has been adcertained to be promising. This has made sure of the economic workability of treating shale put out from the open cut zone, but there still remains the question whether shale output by underground mining will pass the test with as excellent an outcome. It is to solve this remaining question that 500 tons of oil shale has been shipped to Scotland, with two experts specially commissioned to take part in the experiments in Scotland.

However, for treating Fushun oil shale on an industrial scale, the results of the experiments carried on by the S.M.R. Co. central laboratory, using (1) Scotch dry distillation method, (2) naval fuel depôt dry distillation method, (3) Swedish producing plant and (4) naval fuel depôt producing plant), have demonstrated the superiority of the Scotch process. Three kinds of shale specimens, each 30-lb., were forwarded over to Scotland, and the reports sent in have established beyond question the industrial merit of the shale.

The results obtained may be summarized as under:

	Average
Oil obtained from 1 ton shale	12.21 gallon
Sulphate of ammonia from the iron shale ..	50.58 lbs.

Report Prepared in December, 1923

		Gallon	lbs.
Shale sample	"A"	22.00	61.30
	"B"	13.63	53.22
	"C"	8.99	56.83

Supposing that a new dry distillation and oil extracting plant on the Scotch system should be founded at Fushun, the expense and receipt accounts might be roughly estimated as follow:

Scale of Plant

700,000 tons of shale to be treated for 350 days in the year, at the rate of 2,000 tons per day.

Plant Construction Costs

Dry distillation plant	Y.3,600,000
Oil plant	1,500,000
Office, godowns, reserve fund, etc.	900,000
Total	Y.6,000,000

Treatment Cost Per Ton Shale

Dry distillation costs	Y.1.42
Oil extracting costs	1.83
Manufacture of sulphate of ammonia ..	0.89
Disposal of residue shale	0.40
Total	Y.4.54

Outputs and value thereof from per ton shale (containing 8 per cent. oil to be extracted), delivered at the plant, Fushun,

	Gallon	Gallon	Value
Gasoline put out	1.53	@ Y.0.60	Y.0.900
Fuel	4.22	0.20	0.844
Gas and lighting oil.. ..	5.58	0.09	0.500
Lubricating oil	1.54	0.30	0.462
	lbs.		
Paraffin wax..	0.20	0.07	1.400
Sulphate of ammonia ..	0.40	0.0535	2.140
Total value of outputs			Y.6.246

(Gas and fuel oil at Y.20 per ton and sulphate of ammonia at Y.120 per ton).

The total value of the outputs being put at Y.6.246, and the total cost of production at Y.4.540, the balance of Y.1.696 will represent the profit to be cleared from the treatment of every ton of oil shale. At the rate of 2,000 tons a day, the total annual amount to be dealt with will be 700,000 tons, bringing in the total profit of Y.1,187,200. From this profit may be deducted the sum of Y.300,000 for depreciation of the machinery and other equipment, together with the office expenses. In addition, the sum of Y.98,000 may be subtracted as the balance between the mining costs and the assets of the residue shale as a filling-up material, as mentioned later on. Thus, taking off the sum of Y.400,000, still the net profit of Y.787,000 will be left, which will give an income of slightly over 13 per cent. to the capital amount of Y.6,000,000, invested.

The above calculation is based upon the returns obtained from the above mentioned experiments. What actual returns will be given by the large scaled experiment to be carried on in Scotland may be available for publication in about June next. Supposing, for argument's sake, the oil shale industry should fail to be made into a paying venture, still Japan would be in a position to establish a national policy for supplying her own petroleum. This, in itself, will be a matter for congratulation as a provision against emergency.

The United States will export kerosene for the use of the Japanese warships and merchantmen. However, petroleum is subject to embargo in war-time as contraband. It would be the height of thoughtlessness to be contented with the present situation, and to give no thought to an inflated demand from the men-of-war in time of war.

Even allowing that the working of the oil shale industry on a factory scale should turn out an economic failure, the central government ought to be prevailed upon to extend suitable protection and support to this industry.

Again, in case of the same industry proving an economic success, fuel may be supplied at Dairen wharves to oil-driven craft, which contingency will be to the S.M.R. Co. a thing of too much significance to be passed over.

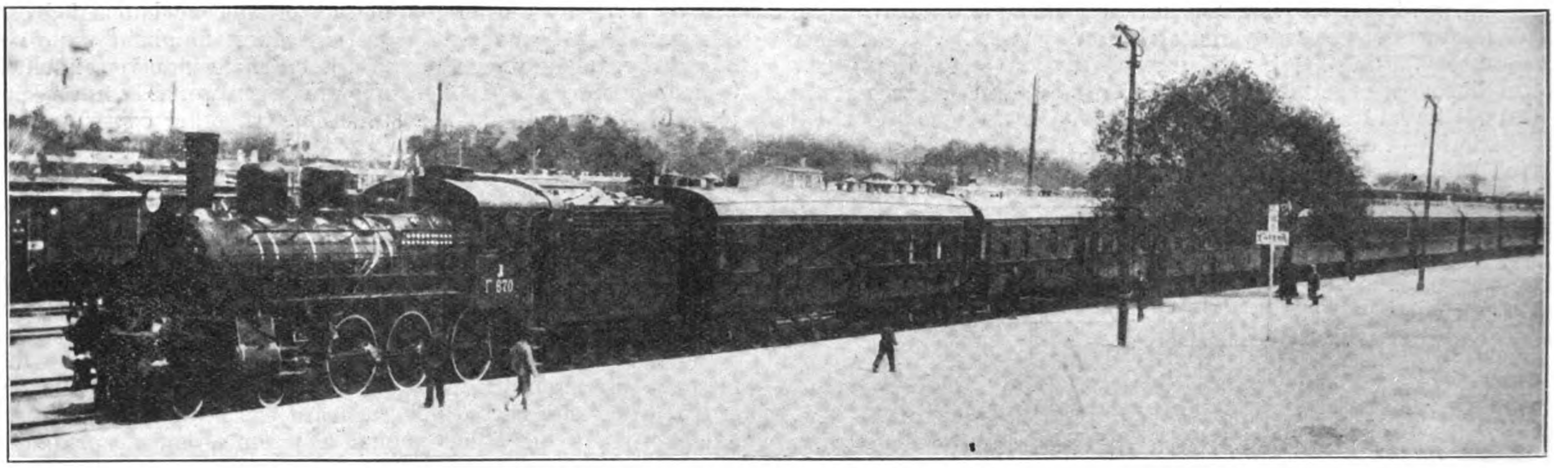
Next, the open cut mining at Fushun collieries can not be carried on without the preliminary stripping and necessary incidental costs, put together, will amount to only about half the costs for underground mining. Thus, the shale having to be stripped off in the order of things, no special price need be attached thereto However, if considered independently, the shale mining cost, inclusive of the transportation cost to the dumping ground and the interest on the incidental costs, etc., are estimated at not more than 25 sen per ton. Now when the residue shale is to be substituted for sand now flushed into the pits, as a filling-up material, the residue will be worth 16 sen per ton in the flushing sand pockets. Now, 70 per cent. thereof consisting of the shale residue, the management will have the gratification to lay out only 12 sen per ton, instead of about 50 sen per ton of sand hitherto in use. This will make a world of difference in favor of the management.

Sarawak Oil Fields

(Continued from page 187).

that, while the construction and preparation of the runway and pipe line take many months, the actual towing out of the line may take less than an hour. A towing hawser some 6,000-ft. long was secured to the eye at the end of the pipe line, and laid out by launches and barges until a depth of water was reached at which it could be hauled on board a tug, which with a tanker, had come as close in shore as possible. On a signal from the shore being given the tug and tanker commenced steaming ahead on a course marked with buoys. Once the line was started it moved evenly forward at an average rate of 3.17 knots, no derailments occurred, and the stop signal was only hoisted when some 14,500-ft. of line had been successfully launched. To complete the submarine line for service 120-ft. of flexible hose 8-in. diameter in 20-ft. lengths is coupled to the sea end of the line by a diver and the other end attached to a buoy. In spite of the great length of the submarine lines and the exposed position of the sea leading station in certain winds, their operation has been very successful, and during 1923 115 ships were loaded or bunkered without any mishaps or serious delays.

From the figures which I have given of production it will be appreciated that a large staff both of Europeans and of Asiatics is required. At the end of 1923 there were 133 European employees with 42 ladies and 39 children. Also 190 senior Asiatic staff and 3,252 coolies. Miri itself has long ceased to be a primitive native village, and now possesses motor roads, railways, electric-light, an automatic telephone exchange, far in advance of anything provided by the post office in London, clubs for European and Asiatic staff, a soda water and ice-plant, a farm producing milk, eggs, beef, mutton, etc., a cinema, a school for European children and another for Asiatic children, a church, a golf course, and cricket, football and baseball grounds. The company also operates a large sawmill on the Bakong river, a tributary of the Baram river, which produces large quantities of timber both for building purposes and for the construction of drilling rigs.



Pullman Express Train on the Chinese Eastern Railway

The Chinese Eastern Railway

Notes on its Working Results

As a result of the economic crisis following the war and the Russian revolution, the Chinese eastern railway was transformed from a trans-continental trade artery connecting Europe with the Pacific to a purely local line relying for its existence upon the export of Manchuria cereals and a limited importation of general cargo for the requirements of its own zone. Before the revolution the line enjoyed a liberal subsidy and support from the Russian government who also directed its economic policy. With the advent of the Soviet *regime* it was thrown entirely on its own resources and was forced to devise a new operating program and adjust itself to changed conditions.

In a recent report of Mr. Ostroumoff, he says that during 1920, the year previous to his taking over the management, new industrial enterprises sprang up in the railway zone, trade and industry flourished and commercial transactions increased, all of which was reflected in the volume of freight handled by the line. This activity, however, was a direct result of the fall in the value of the rouble causing commodity prices to soar to unheard of levels. Exchange was favorable and fortunes were made in a day. Bills of lading issued by the railway passed through many hands. The boom attracted an ever increasing number of buyers and wild speculation was the order of the day. The higher the railway raised its freight rates, the public refused to be alarmed, for although the rates were quoted in gold roubles they collected in Romanoff, Kerensky and Siberian bank notes which gradually lost their value. This fever of speculation was also taken advantage of by many to unload their hoards of paper money.

When the bottom fell out of the rouble in 1920 and the railway insisted on hard currency in payment for frieght, a financial catastrophe followed. Bankruptcies were common. Millionaires became beggars overnight. The evil effects of this year are felt even to the present time. This occurred just prior to the change in the management of the road, which took place in February, 1921.

The business of the line was in chaotic condition. The employees had lost all sense of discipline, duty and responsibility. The line was being operated only on the Harbin-Changchun branch, the traffic towards Vladivostok being almost nil, as only 3,000,000 poods of freight had been transported in this direction during 1920, an average of 10 cars a day. There was no communication westward towards Manchuli. Through communications with the Chinese and South Manchuria railways had ceased. Trains were operated with great delays. The cars were dirty, neglected and lacking in even elementary comforts. There was only one train with decent rolling stock.

The goods rolling stock could not meet the heavy demands. The number of cars per train were small, speed was impossible, so the inevitable Chinese cart captured the business. During 1920, 60,000,000 poods of freight were carted from the C. E. zone to Changchun, or about 55 per cent. of the total grain production of the country.

The number of engines was inadequate. Repairs were made without reference to cost. Trains were frequently disconnected by the breaking of couplers. Hot boxes and blazing axles were a constant occurrence. The costs of fuel and lubrication were excessive. The railway administration was completely cut off from contact with the line, which was operated by the employees without system, routine or accounting.

Maintenance was expensive and carried on without any regard for the administration. Buildings and other structures had not been repaired or painted for years, while those which had been destroyed or damaged by fire were never rebuilt. All buildings, those in Harbin included, were indescribably filthy and required extensive repairs. The road houses were in a deplorable condition.

The inability of the railway to meet the traffic requirements during 1919 and 1920 resulted in the accumulation of huge masses of cargo at all stations. Shippers had the greatest difficulty in obtaining cars or space. To meet this situation the railway employees put into practice the plan of selling cars, and even whole trains to shippers at excessive rates in hard currency, which sums were not turned into the administration offices. Great sums were lost to the railway through this practice, as to date no satisfactory audit is possible.

Materials were purchased against hard cash, and at an exchange most unfavorable for the railway. Firewood reached 55-58 gold roubles per cubic sagen (about $11 gold per cord) while coal from the railway's own mines at Djalainor cost 35 gold copecks per pood (or over $11.00 gold a ton). Free competition in tendering for supplies was waived and the railway became the prey of a contractor's monopoly which fixed its own prices for commodities.

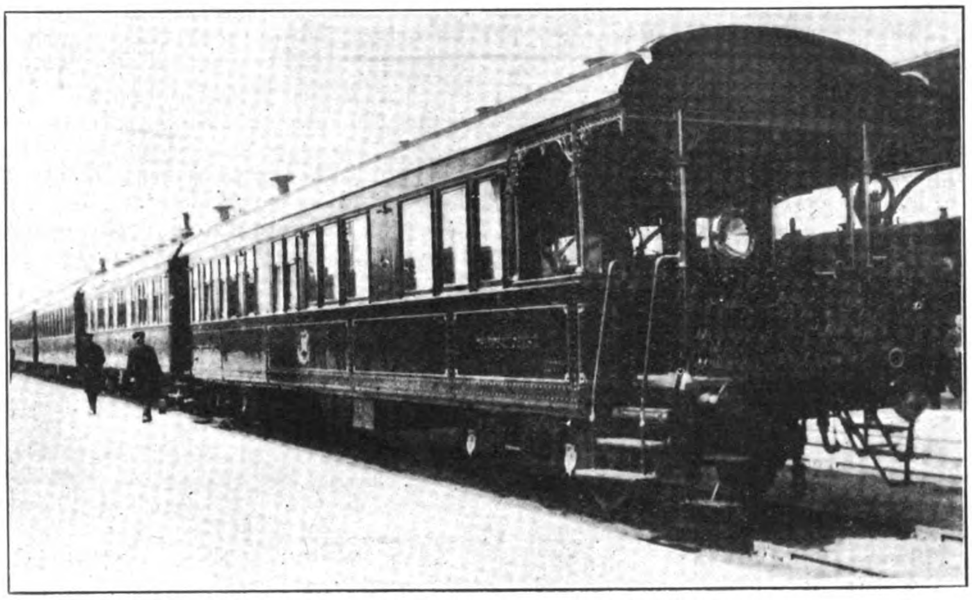
When the railway enforced the payment of rates in gold roubles in December, 1920, the traffic fell to 2,565,700 poods. In January, 1921, this increased to 3,856,382 poods and in February to 4,381,975 poods. In one year or by December, 1921, 12,081,211 poods were carried: 9,383,373 poods in January, 1922 and 5,658,848 in February.

It was obvious from these figures that freight rates had been maintained at too high a level and that a continuance of such rates would lead to suspension of traffic. A reduction in rates was therefore made in March 1921, which resulted during the year of raising the total volume of traffic to 127,000,000 poods, of which over 26,000,000 were consigned to Vladivostok. In 1922, the line carried, 152 million poods (50 per cent. more than in 1921) of which 37,000,000 poods went to Vladivostok. The first half of 1923, showed 98,500,000 poods of which over 28 million went to Vladivostok. With the reduction in freight rates, the administra-

tion undertook to decrease the operating expenses which in 1920 amounted to 47,019,208 roubles. In 1921 this was reduced to 32,420,216 roubles, in 1922 to 27,500,000 roubles, while in 1923 it was expected to bring it under 26,000,000 roubles.

The report of 1921 shows that after allowing for all the vagaries of exchange, the net operating income was equal to 7,365,460 gold roubles against 6,400,702 gold roubles for 1913-14. In 1922 it was 9,030,000 roubles and for the first half of 1923, 5,182,836 roubles. In comparing these working results, Mr. Ostroumoff says that the line under his management enjoyed a prosperity equal to if not greater than its pre-war days, despite all economic and political problems, lack of through cargo and other drawbacks. In other words, it proved its value as a purely local line dependent upon the districts served for its business, all of which he declares, is due entirely to his policy of reducing freight rates. When he took over the management of the line in 1921, the first problem was to open the line for exports to Vladivostok, at which port the C. E. R. owns the splendidly equipped Egersheld wharves, and in the course of the year the results above-mentioned were obtained, while goods traffic on the western section was resumed in a small way.

Mr. Ostroumoff dwells on the various problems confronting the C.E.R. in its relation to the S.M.R. The Japanese line for a long time protected the native cart traffic which brought the produce of northern Manchuria to its Changchun terminus, thus depriving the Harbin-Changchun branch of the C.E.R. of much valuable traffic. After several conferences an agreement between the two lines was arrived at by establishing the principle of equal tariff rates for grain shipped over the Southern C. E. line to Dairen and from the same line to Vladivostok. This, however, did not materially change the situation for the C.E.R. for the reason that the trade of the district served by its Harbin-Changchun branch gravitates naturally towards Dairen. However, grain exports via Vladivostok increased under the agreement from 23.4 million poods in 1921 to 33.4 million poods in 1922 and 26.6 million during the first half of 1923. This was due to the increasing quantities shipped direct from Harbin to Vladivostok without change of gauge and breaking of cargo as is necessary in transhipping at Changchun.



Observation Car on Express Train of the C.E.R.

Any great increase in these through Vladivostok shipments are however hindered by the capacity of the Ussuri railway between Programchnaya and Nikolsk on which not more than 15 trains per day can be operated, due to the exceptionally heavy grades and the limitation of sidings too short to accommodate a full freight train. Another drawback to the profitable operation of the eastern section, is an almost complete absence of import cargo, which compels the return of full rains of empties doubling the operating expenses on the outward shipments.

Working agreements have also been entered into with the Chita section of the Trans-Siberian railway, while the Ussuri railway administration agreed to take part in a direct oversea traffic arrangements to be made with the Robert Dollar Company of America.

Aside from the urgent necessity of reducing the freight rates, Mr. Ostroumoff was faced with the working out of a complete new economic program for the development of the railway and the districts served. Before the Russian revolution when the line was directed from Moscow, its guiding policy was to facilitate through Trans-Siberian shipments. The development of its local traffic was subordinated to the larger interests of Russian trade. In order to draw up a comprehensive program for the development of its own business, an economic bureau was created to gather trade and industrial statistics and its investigations have been published in one large volume, which will shortly appear in English.

A new policy was established in working out tariff schedules, in which many problems have been considered. It was necessary to devise rates that would permit the railway to compete with the cart traffic, especially in the Harbin-Changchun zone. It was also decided to support and protect local milling industries, to build grain elevators and provide for the mixed storage of beans and bean oil, to encourage exports via Vladivostok and attract imports through the same port by conceding advantages in freight rates. Although a definite program has not been worked out, the preliminary measures taken to develop the line have increased the traffic from 102,-286,613 poods in 1920 to 151,605,464 poods in 1922 and 98,500,000 in the first six months of 1923, or nearly a hundred per cent. increase in three years. The amount of produce hauled out of the district by carts decreased from 62,000,000 poods in 1921 to 13,000,-000 in 1922.

In 1921, bean oil was transported for the first time in tank cars equipped with a heating apparatus for the winter months, while at the Egersheld wharves at Vladivostok special storage tanks were erected from whence the oil is pumped directly into the steamer's tanks. In 1922, the C.E.R. special grain conveyors were being installed at the Egersheld wharves for unloading grain from the cars into storage godowns and from there to the steamers. The expropriation of the wharf by the Soviet authorities have prevented the completion of this much necesasry improvement.

Prices of fuel have been reduced from 58 gold roubles in 1920 to 36 gold roubles in 1922 while coal which cost 33 copecks per pood in 1920 was purchased in 1922 at 12 to 13 copecks. The consumption of firewood and coal was greatly reduced in two years resulting in a saving to the railway of nearly 11,000,000 gold roubles.

Traffic Department

The disorganization of the freight service created an enormous congestion of traffic which called for a radical improvement in the traffic department. By the end of 1923 the speed of passenger trains had been increased from 65 to 77 versts per hour for the southern line and from 50 to 77 versts on the main line, a saving of 14 hours in the running time between Pognanitchnaya and Manchuli. Pullman cars for the three classes equipped with sleeping berths and electric lights have been placed in operation on the mail trains, with a buffet and observation car attached during the summer months. For the expected resumption of through service with Moscow two sets of express trains made up exclusively of Pullman cars are in readiness, while a special "train de luxe" composed of baggage, dining, two first class and a saloon car, supervised by the International Sleeping Car Company is available for private parties. Special two axle private cars are also available for passengers.

A great improvement was also made in the freight service and now averages 18 versts per hour as against 12 versts in 1920. Nineteen sets of large sized American freight cars with automatic brakes have been acquired and the length and weight of trains considerably increased. On some of the sections, freight trains of 70 cars weighing up to 100,000 poods are now operating against a former train of

60 cars weighing 65,000 poods. Decapod engines on other sections are now hauling trains weighing 80,000 poods on other sections where formerly the maximum weight was 65,000 poods. The average train load in 1920 was 16,162 poods and in 1923 over 30,000 poods. In 1920, the railway was using 9,621 cars, with an average of 713 cars loaded per day. In 1922 only 7,572 cars were in use with an average of 784 cars per day. This has permitted the railway to accumulate a large surplus of rolling stock, repaired and in good order for instant use. Considerable improvements have been effected in loading and unloading cars and the losses from claims on damaged or lost goods dropped from 63,000 roubles in 1920 to 26,996 roubles in 1922. The stations have been repaired and comfortable quarters provided for employees and traveling agents.

Though the number of pood-versts has increased the number of employees has been diminished and a reduction on operating expenses achieved. The number of pood-versts in 1920 was 4,116, 710,000, with a staff of 3,482 and operating expenses of 398,445 roubles. In 1923, the number of pood-versts was 5,544,013,000, with a staff of 2,317 and expenses of 225,659 roubles.

Rolling Stock

In 1920 the expenses of the locomotive department accounted for 50 per cent. of the railway budget. This was reduced by 1922 to 41 per cent. The number of effective engines was 536, of seven different types, of which 36 per cent. were laid up for repairs. By 1923, the number of engines in bad order was only 17 per cent. of the total. A regrouping of the locomotives on the different sections utilizing their fuel tractive power and increasing the weight of the trains, effected a great reduction in the number in operation. During the export seasons of 1921-22, 281 engines were in service while in 1923 only 181. Up to August 1923, the railway had 110 engines in service with 333 in good order in reserve.

The railway has a total of 610 passenger cars of which half were unfit for service in 1920. At present, about 26 per cent. are unserviceable, with 249 cars in operation and 186 in reserve.

In regard to freight cars, the C.E.R. comes under the general direction of the Russian state railways and does not possess its independent rolling stock, being obliged to use those of the Russian lines. The interchange of cars is effected at Pogranichnaya, car for car, under a special reciprocal agreement. The freight rolling stock of the C.E.R. is therefore not permanent, but partly interchangeable, which leads to difficulties in their upkeep. The total number of effective cars is about 12,000 of which 9,562 belong to the C.E.R. This number is made up of standard Russian Cars with a carrying capacity of 750, 900 and 1,000 poods ; American 2-axle cars of 1,200 poods, 4-axle cars of 2,700 poods and gondolas of 3,000 poods. A regrouping of these cars on the various sections has increased the axle load, decreased the number of train cars and the number of trains.

Fuel

The locomotive department consumed about 70 per cent. of all fuel purchased for the line. In 1920, the cost of fuel was 12,000,000 roubles while in 1923 it was reduced to 3,000,000 roubles. This great saving was effected by a lowering of price and a decrease in consumption per unit of work. This was brought about by regrouping of engines ; increase of weight of trains to full utilization of tractive power ; regrouping of cars : installation of arches and arch tubes on engines ; use of firewood and coal in a proportion based on investigations and by paying a bonus to the engineers for practicing economy.

Under this system, and notwithstanding the increased speed of trains the fuel consumption decreased from 0.834 cu. sagens per 1,000,000 gross pood-versts in 1920 to 0.508 in 1923, or 38 per cent.

With other improvements inaugurated in the shops and road houses and by a considerable reduction in personel, the total expenses of the rolling stock department was reduced from 23,705,000 roubles in 1920 to 9,605,000 in 1922, with 5,046,000 for the first seven months of 1923.

The Day of the Automatic Telephone

(Continued from page 166).

by the beginning of next year. Telephone apparatus for these central offices already has been ordered from America and several Japanese concerns, but the order was so large that the goods will not be received until September. At any rate, we are planning to install the automatic telephones as soon as possible."

Before the earthquake Tokyo had 110,000 telephones which were subscribed to by 82,000 persons. As a result of the destruction of 16 telephone offices by the quake, the number of subscribers was reduced to 18,000. In addition to this the long-distance call station situated in the Marunouchi was destroyed completely.

The authorities, however, made a desperate effort to establish communication with other parts of the country immediately following the quake and succeeded in the attempt on the sixth day after the earthquake by using old and imperfect apparatus. In the meantime, work of restoring telephone service in Tokyo had been rushed, and by September 5 about 200 telephones connecting the imperial household department and government buildings were restored.

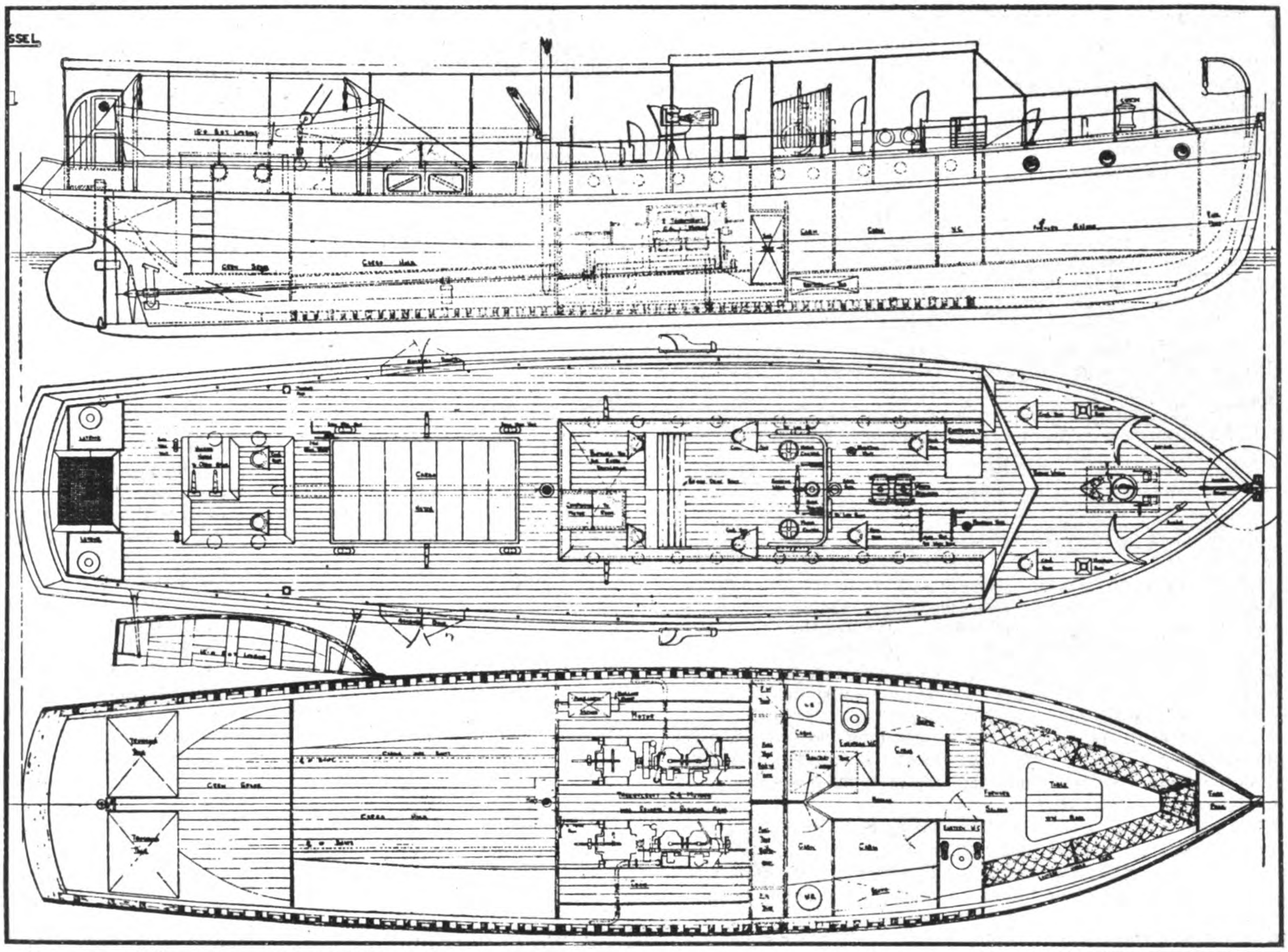
Equipment in the four central offices which escaped fire was damaged by the earthquake. They have been gradually, however, repaired and by September 29 were completely perfected. The long-distance telephone station was not restored completely until December 1. The telephone exchanges now operating are Aoyama, Takanawa, Koishikawa, and Ushigome, all of which are situated uptown. Mr. Shimmyo reports that the Marunouchi centre will be opened on February 10 and the Yotsuya centre March 10.

A Typical Tokyo Exchange

Special Service Installed

As a measure to meet the immediate need pending the installation of the automatic telephone service, the telephone bureau has been establishing the so-called special telephone service which is somewhat similar to the private exchange in the American telephone system. About 200 subscribers living within three *cho* of a telephone centre who are urgently in need of a telephone service may make an application for the establishment of a sub-centre. The establishment of the sub-centre costs about Y.300 for each subscriber and is to be operated at the expense of the telephone bureau. Thirteen sub-centres already have been established and 65 are authorized. The subscribers are charged the pre-quake rate for this service.

Another emergency measure is the introduction of an improved system of booth telephones, similar to those operating in large railway stations in America. This telephone station is operated by a regular telephone operator with a number of messenger boys. These messenger boys will carry a telephone call anywhere within five *cho* of the place where the station is situated at a charge of 10 sen per call. Fifteen stations of this kind have been established, some of which are situated at the Marunouchi building, stock exchange building, the Ginza and near Kyobashi, and 50 are authorized. Besides these emergency measures the bureau is planning to establish at least 500 public telephones in various sections of the city.



THORNYCROFT PASSENGER AND CARGO VESSEL FOR H.H. THE MAHARAJAN JAMB SAHE OF NAWANAGAR, G.B.E., K.C.S.I. (RANJITSINHJI) NAWANAGAR—CUTCH SERVICE

FITTED WITH THORNYCROFT C/4 TYPE ENGINES AND REDUCING-REVERSING GEAR POWER: 100 b.h.p. SPEED (Approx.) 8½ kts. DESIGNED AND CONSTRUCTED BY JOHN I. THORNYCROFT & CO., LIMITED

Passenger and Cargo Boat for Ranjitsinhji

THE launch took place on Thursday, November 29, of the very interesting motor boat *Halari* which has been ordered for his state by His Highness The Maharajah Jam Sahib of Nawanagar, G.B.E., K.C.S.I. (so well known as Ranjitsinhji).

She has been constructed by Thornycrofts at their Hampton Launch Works, Hampton-on-Thames, under Lloyd's survey for passenger and cargo work across the Gulf of Cutch from Jamangar to the ports in the state of H. H. The Maharajah of Cutch.

This service, which is rather more than the distance between Dover and Calais, is to be maintained throughout the year, including monsoons; and the boat has, consequently been very carefully designed and constructed to withstand not only the heavy weather incidental to the monsoon season, but also the extreme heat which is the condition during all but a short period of the year.

The hull is constructed on Thornycroft's system with teak planking, heavily copper sheathed to well above waterline, the timbers being very closely spaced with grown floors, reinforced with iron throughout.

The accommodation has been specially designed for the service, to provide comfort for all the classes of passengers who will be using the vessel. The total passenger capacity is about 140 persons. A first class cabin is arranged forward with cushioned seats, table and usual saloon accessories. From this space access is available to four separate single berth saloons with separate Eastern and European lavatories.

A hold is aft of engine space, with derrick, etc., for handling about 20 tons of cargo expeditiously. The hold is also so arranged as to be converted to third-class passenger accommodation in monsoon weather.

The steering position is amidships with reverse controls alongside wheel, and a double awning with side curtains is provided all fore and aft.

The dimensions of the *Halari* are:—

Length O. A.	74′ 0″
Beam O. P.	16′ 0″
Depth mld	7′ 3″
Draft	5′ 0″

After considerable deliberation and comparison with the results already obtained with a number of other types of engines, the Thornycroft C/4 type 50 b.h.p. engine with reducing reversing gear has been adopted, from the point of view of comfort to passengers, small space occupied, the high propulsive efficiency and economy in fuel.

These engines are running on kerosene, the consumption working out under normal conditions of service at about 7 gallons per hour, a notable result for engines of this size.

The speed expected on trials which are to take place immediately is 8½ knots.

The vessel is being shipped by the White Star liner *Runio* to Birkenhead where she will be transhipped to the *Circassian* for Karachi. From Karachi, she will be navigated to Nawanagar, a distance of about 400 miles, under her own power.

The acquisition of this boat by His Highness The Maharajah Jam Sahib of Nawanagar is a further example of his well-known fore-sight and interest in the development of his state, which is regarded as one of the most up-to-date in India.

Thornycrofts have already delivered to his highness several motor launches of varying sizes and types and now have under construction for him other craft including an 800-ton cargo steamer with which it is intended that further developments in the distribution of the produce of the state will be made.

For his highness's personal service, a most interesting yacht of the Thornycroft sailing motor yacht class is now well underway at their Hampton yard.

General Electric Notes

THE Tata Steel & Iron Company in India are installing at Jamshedpur a 6,300 horse-power motor, built by the General Electric Company, U.S.A., to be used to drive a combination rail and structural mill which they will operate there. This motor weighs 476,000-lb., has two armatures and one shaft. Its overall length is 25-ft., its width, 15-ft. and height, 12-ft. 8-in.

This mill motor has a capacity equal to turning out enough 85-pound rails in one hour to lay a two-rail track for 1.5 miles, or 200 tons of rails per hour. It is in two units, with armatures mounted on the same shaft, each unit developing 3,150 horse-power. Its motive power will be derived from two 2,500 kilowatt generators at 600 volts which, in turn, will be driven by a 6,500 horse-power induction motor at 3,000 volts. The latter motor will receive its power from the mill power plant. A flywheel of 110,000-lb. weight is part of the unit. The motor has speed adjustment from 0 to 80 r.p.m. by generator field control and from 80 to 120 r.p.m. by adjustment of the field of the motor.

Owen D. Young, chairman of the board of directors of the General Electric Company and recently selected as a member from the United States of the reparations committee to help balance the German budget and stabilize the mark, sailed for Europe from New York, December 29. Two Americans were invited to serve, the other being general Charles G. Dawes, former director of the United States budget.

Mr. Young started life on a farm at Van Hornesville, N.Y. He managed to secure an education at St. Lawrence University and later studied law in Boston, where he rose rapidly in this profession. In 1913 he became vice-president and general counsel of the General Electric Company, and, in 1922, was appointed chairman of the board, when he was but 48 years of age. He is also chairman of the board of directors of the Radio Corporation of America.

Apparatus Weighing 320 Tons is Shipped from America to Japan

Two 25,000-kv-a., 11,000-volt, 600-r.p.m., 60-cycle synchronous condensers, the largest over built for foreign shipment by the General Electric Company, U. S. A., have just been shipped to Japan. These condensers with transformers and control equipment were ordered by the Nippon Electric Power Company for installation in Osaka, the industrial centre of Japan.

These condensers will be used for power-factor correction on 154,000-volt transmission lines which serve a large area of Japan. They will also be utilized to control voltage and supply charging current losses in the line. The continuous rating is 25,000 kv-a: at zero power-factor leading and 22,750 kv-a. zero power-factor lagging. The total net weight of each condenser, including direct connected exciter and starting motor, is about 160 tons, with a shipping weight of approximately 185 tons.

The rotor alone weighs 70 tons. The poles were removed before shipment in order to reduce the weight. The stator or armature was shipped in two sections, the whole weighing 54 tons.

The seven transformers also supplied by the General Electric Company were 10,000 kv-a., 140,000 volts. Each unit complete with oil weighed 50 tons, with a height of more than 27-ft. They will be installed in two banks of three units, with one unit as a spare.

Although equipped with direct connected induction motors for starting, the condensers have been designed to start from the low voltage taps of a bank of single-phase transformers, thereby functioning for the time being as an induction motor.

The control equipment is of the semi-automatic magnetic type, and was specially designed for accelerating the condensers under the various torque conditions of running light, synchronizing the line charging.

Three additional units of similar character, together with the necessary transformers and auxiliary equipment, are also planned for future installation. This would give an ultimate capacity of 125,000 kv-a., in one station.

Japan Places Order for Giant Electric Generator

Schenectady, March 2.—The largest single unit turbine generator ever sold for export has been ordered from the International General Electric Power Company of Japan.

This G-E Curtis turbine has a capacity of 50,000 horse-power and will drive a generator which will supply 35,000 kilowatts of electric current at 11,000 volts, enough to light 1,000,000 of the average Japanese homes. With the exception of the rotor, the machine will be disassembled for shipment. The revolving field of the generator, which is 27-ft. long and 4-ft. in diameter, will be made from a single forging and will weigh about fifty tons. This will turn at a speed of 18,000 revolutions per minute.

This order, including accessories and switchboard equipment, represents an initial capital expenditure of more than $1,000,000. The new unit will be located in the city of Nagoya.

Baldwin Westinghouse Locomotive

The two Baldwin-Westinghouse electric locomotives furnished to the Japanese government railways are now in service near Tokyo. Designed primarily for local freight service over lines having heavy grades they may be operated in multiple as a road freight locomotive of 121 tons dead weight. Following are the principal dimensions of the two locomotives: Weight, 120,950-lb.: Weight per driving axle, 30,240-lb.: Diameter of wheels, 49-in.: Rigid wheel base, 9-ft. 1-in.: Total wheel base, 29-ft. 4-in.: Maximum speed, 40 m.p.h.: Starting tractive effect, 30,240-lb.

Two axle hung motors, inside hung and direct geared to the axle, are carried on each truck. These locomotives will be given close supervision while in service with a view to the acquisition of data concerning actual traffic requirements as well as of operation before determining the extent of the general electrification and the type of equipment on the government lines.

In addition to the locomotives supplied by the Baldwin-Westinghouse companies to the government railways several are in operation on the Chichibu railway, a system traversing a district rich in the natural wealth of mines and quarries and noted for its production of raw silk.

For many years this railway was operated under steam power, but increasing freight movement and the ever-present fuel problem made it imperative to seek a solution of the power difficulties. Moreover, the development of electric plants in this district had been rapid and an ample supply of current was ensured. After a careful consideration, therefore, of all the operating factors, a decision was made calling for the electrification of the line from Kagemore to Kumagaya, a distance of 35 miles of main line.

Power is supplied by the Musashino Electric Power Company, transformed through two substations to 1,200 volts direct current.

Three multiple unit cars, equipped by the Westinghouse Company, will be operated in passenger and express service. Five Baldwin-Westinghouse electric locomotives were shipped in October 1922, to handle mixed freight and passenger trains, which as a rule consist of four passenger cars and fourteen goods cars, making a total of approximately 204 gross tons. The electric locomotives are of the 0-4-0+0-4-0 non-articulated type, built for 3-ft. 6-in. gauge track with 38-in. wheels. They weigh approximately 82,150-lb.

A New Shanghai Cotton Mill

The Dong Shing No. 2 Mill

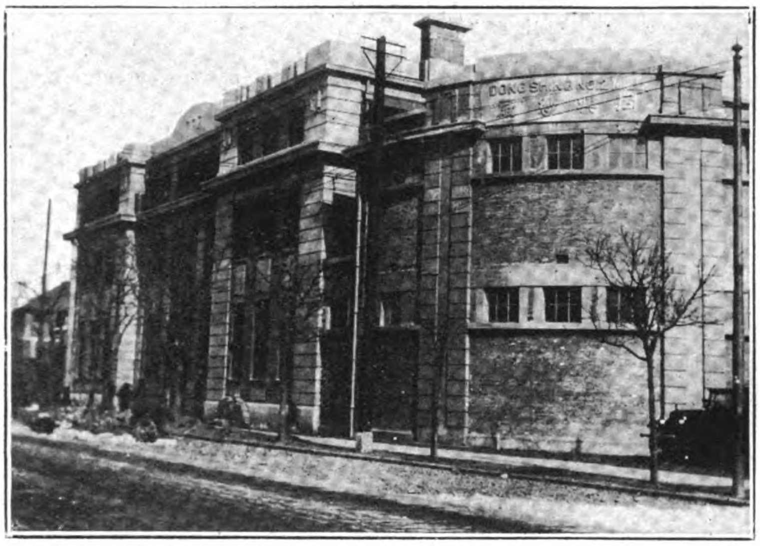
NUMBER two mill of the Dong Shing Spinning and Cotton Weaving Company was completed in March and will commence operation in April, 1924 with 28,000 spindles and 952 looms. It occupies an area of 58 mow with its office fronting at number 96 Yangtszepoo Road and the property running back to the godown which looks out upon the jetty and the Whangpoo River. The plant consists of a three-story office, three spinning mills of two stories each, a one-story weave-shed with saw-tooth roof, 16 two story personnel houses for Japanese members of the staff, and a godown of three stories. The plant is of reinforced concrete with the exception of the weave-shed, which is of brick. The architect is Mr. S. Okana and the constructors Sing king-kee. No addition on account of the construction new mill has been made to the capital of the company. The nominal capital is Y. 15,000,000, of which Y. 6,000,000 is paid up. With the commencement of operations, however, a call will be made on the shareholders for another payment of Y. 2,500,000.

It is expected that when the plant is running to capacity it will employ 3,000 hands, and will take from the municipal electricity department 1,800 kilowatts of power. The plant is at present complete except for the installation of the transformer, and wiring, and for the connecting up of the machinery. The largest part of the machinery is Japanese, made by Toyoda, following British patterns, and the remainder is British, supplied by Platt Brothers. Construction was commenced in December, 1922.

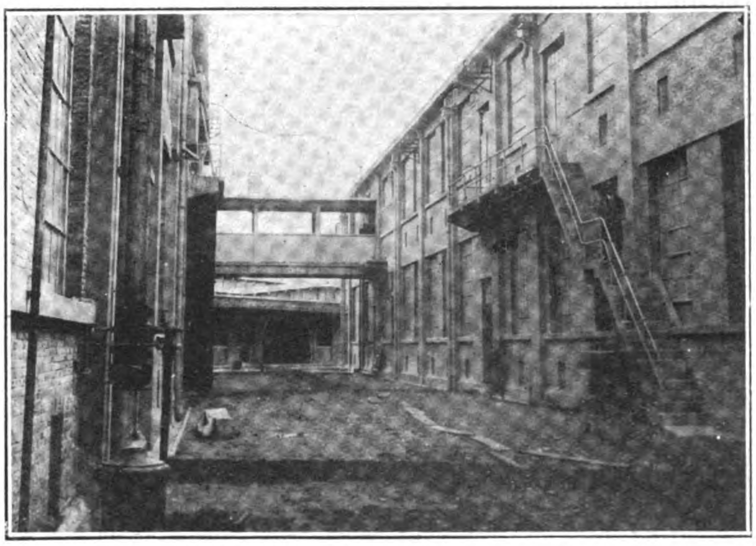
The size of the plant may be gauge by the areas of the buildings, which are as follows; spinning mills (counting all floors) 74,088 square feet; weave shed, 109,000 square feet, including a dining room of 5,000 square feet for the personnel a carpenter shop and machine shop with a combined area of 8,800 square feet, and a boiler room occupying 1,920 square feet. The total area of the three floors of the godown is 12,240 square feet, and space has been left for the possible erection in the future of another godown of the same size.

The cotton will go through three bale breakers and two Creighton openers equipped with willows and lattice feeders; from the opening room it will be conveyed through hopper feeders to two roving openers which will in turn move it on to six interscutchers and six finisher scutchers. This machinery is entirely supplied by Toyoda, as are the 129 carding engines to which the cotton now passes.

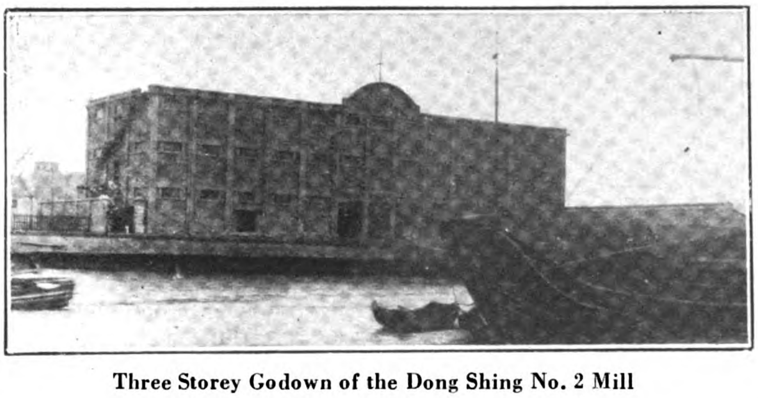
From the carding machines the cotton slivers pass over drawing frames of which 21 are Toyoda and 6 Platt Brothers; thence to slubbing frames of which 14 are Japanese and 4 British. From here it goes to intermediate frames, of which 15 are Japanese and 6 British; to roving frames of which 27 are Japanese and 16 British, and then on to the ring frames in the spinning room.



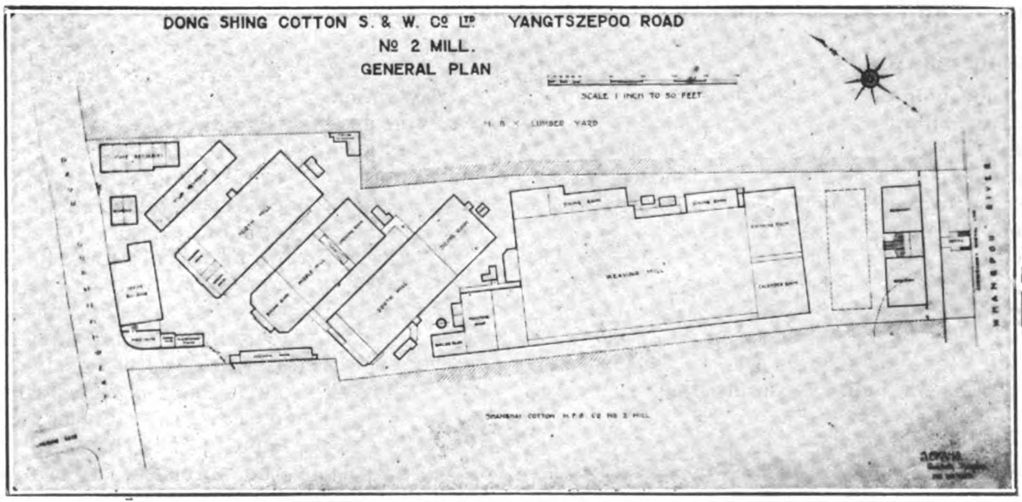
Office of the Dong Shing No. 2 Mill on Yangtszepoo Road, Shanghai



Passage between Middle and South Mill

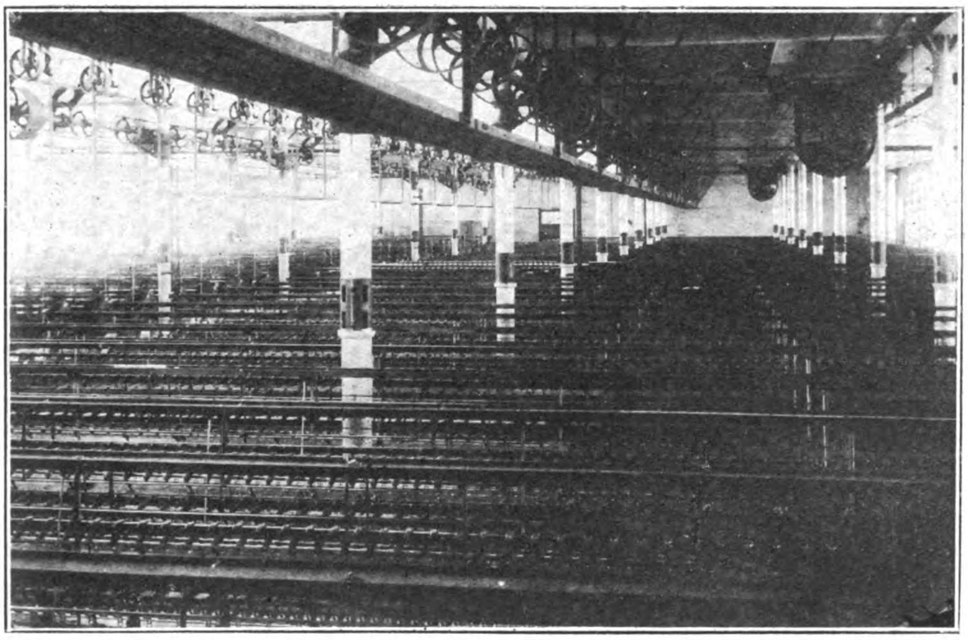


Three Storey Godown of the Dong Shing No. 2 Mill

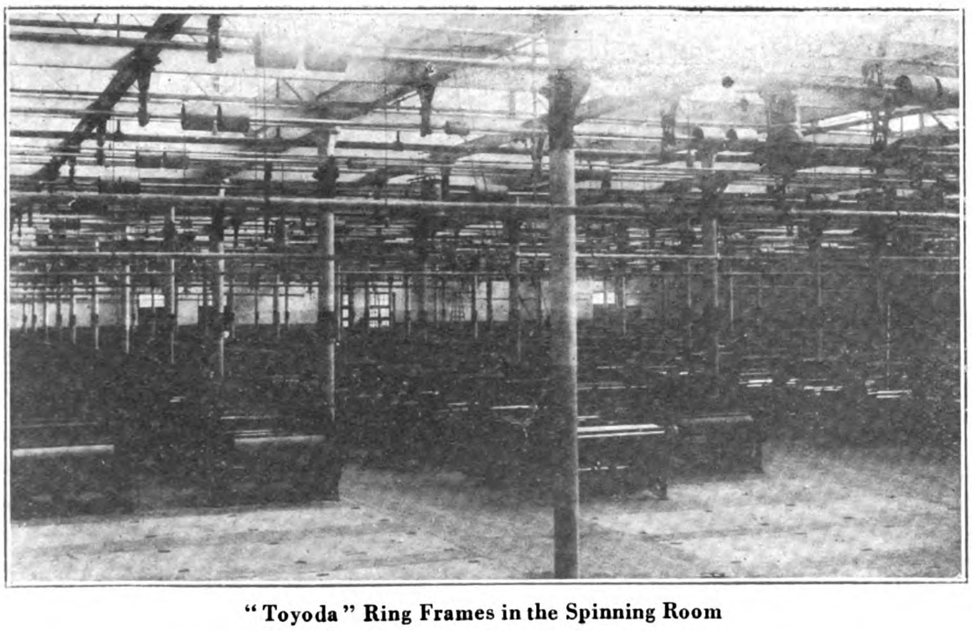


General Plan of Dong Shing Cotton Spinning and Weaving Company

Carding Machines and Drawing Frames



Weaving Shed



"Toyoda" Ring Frames in the Spinning Room

Of the warp ring frames 22 are Japanese made and 20 British made, each frame containing 384 spindles. The weft ring frames, each containing 424 spindles, are all Japanese.

Power is supplied to the spinning frames by two motors in each room connected with an overhead shaft, which in turn drives the frames. The belting was supplied by the Belting and Leather Products' Company, an American firm. All of the looms are Japanese.

The machine-room contains three engine-lathes, eight, six, and 12-ft. long; a 16-in. gear hopper machine; a 16-in. back-geared crank shaper; a 20-in. upright drill; a bench drill; gas welding apparatus, and other small machines. The boiler room contains two Lancashire boilers seven by thirty feet for the production of heat only.

A transformer station on the premises will step down the municipal electricity department current from 6,000 volts to 2,000 volts for motors of 50 horse-power and over, to 350 volts for motors below 50 horse-power, and to 100 volts for lighting purposes.

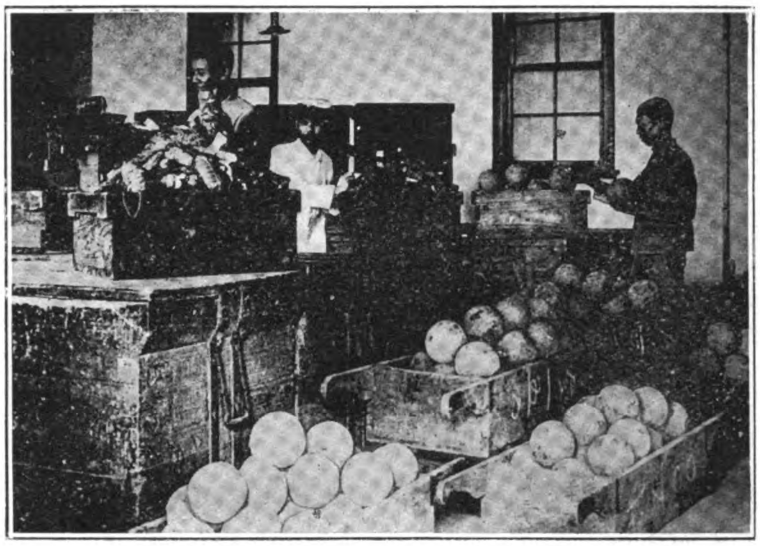
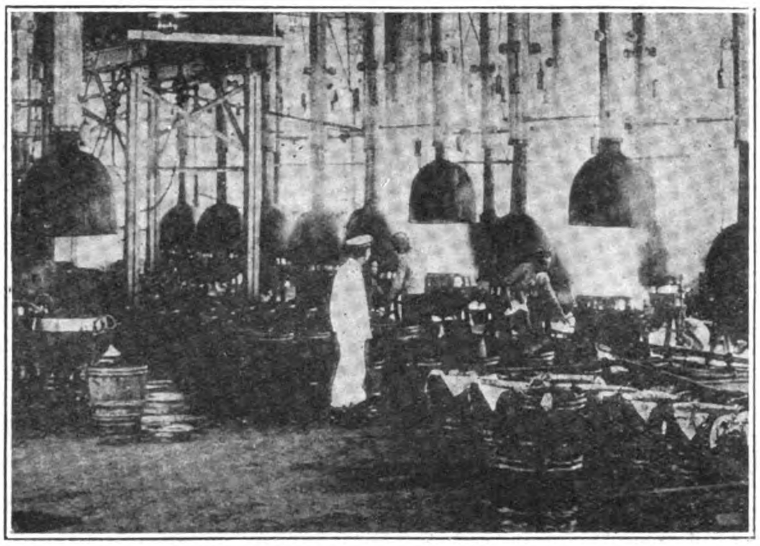
When the new plant commences operation, the company will move its head offices from their present location at 181 Gordon Road to the new plant at Yangtszepoo. This step is taken not only on account of the importance of the new plant, but with a view to construction of a possible future plant on the opposite side of the river at Pootung.

Mitsui Interests Form Trust Company

The formation of the Mitsui Shintaku Kabushiki Kaisha or Mitsui Trust Co. (Ltd.), to commence operations in March, is a proposed new activity of the Mitsui interests, according to a report, in the Tokyo *Asahi*, which has been confirmed verbally by Mr. Oshima, director of Mitsui Gomei Kaisha.

The capital is reported as 30,000,000 yen (1 yen= $0.4538 at current exchange), in 30,000 shares of 100 yen each. One-half of the stock is to be subscribed by the Mitsui Gomei Kaisha or holding company of the combined Mitsui interests. The other half will be taken by subsidiary companies and individuals connected therewith, no shares being offered the general public.

The functions of the new company will be the ordinary fiduciary acts provided by the trust law of Japan, such as holding in trust for individuals or corporations (1) money, (2) securities, (3) claims or debts, (4) movable property, (5) real estate, and (6) land leases, etc. Further supplementary functions are as follows: Safe-deposit service; guaranty of credits; acting as agent in real estate or leases or in financing operations; insurance of public loans, corporate debentures, or corporate stocks; the disbursement of dividends; the handling of fiscal matters; and the purchase, disposal, or management of properties or liquidation of businesses.

Interior of One of Camphor Refineries of the Japanese Monopoly Bureau in Formosa.

China and Japan's Camphor Monopoly Threatened

A New Synthetic Camphor Process

TO quote the *Journal of Commerce*, " One of the greatest discoveries ever made in the field of organic chemistry took place last year, says the *N. Y. Journal of Commerce*, when Prof. R. J. Moore, formerly instructor at Columbia University, announced that he had found a process for converting turpentine into synthetic camphor."

It is this process, perfected by Professor Moore, who is one of the officials of the chemical refining syndicate, which is the basis of a new industry started in Brooklyn by the chemical refining syndicate. Tentative orders have already come in on the basis of the samples shown by the large force of salesmen.

The first steel unit of the proposed plant in this borough is now being erected at the Frasier Tablet Company at Nos. 453-473 Nineteenth street. The process employed is now secret, but will shortly be patented.

There are extremely few people who realize the vast importance of camphor in our every-day life. There are probably even still fewer who know that for years Japan has absolutely controlled the camphor output of the world. From time immemorial it was controlled by China and Japan. Then Japan secured the Island of Formosa from China and her monopoly became complete, because Formosa is the leading single spot where the camphor tree grows.

Camphor is obtained from the wood and leaves of the camphor laurel, a tree which requires thrty years to reach its maturity and then must be cut down before camphor can be extracted. When chopped down it is broken up into chips and the camphor and related oils distilled off. This product is crude and must be repeatedly refined before it is ready for use.

About 15 to 20 per cent. of all the camphor output is used for drugs and medicines. And about 80 per cent. of all the camphor finds its use in some branch of the celluloid industry. Camphor is the basic chemical in the manufacture of plastics, such as celluloid, photographic and motion picture films, artificial or French ivory, such as pyralin, etc., horn ; it is used in the manufacture of patenl leather and explosives. Besides films and artificial ivory there are hundreds of such items as piano keys, art amber, art tortoiseshell, pipe stems, billiard balls, knife handles, toys, toilet articles, in all of which camphor is one of the most important ingredients.

For years the American celluloid industry has not been able to get its camphor requirements. Years ago Japan did not use any of the camphor for herself. She used little in her own drugs and she had no celluloid industry. But since the war began she has been rapidly developing a celluloid industry. She has built and is building some of the largest plants for the production of the celluloid type of products in the world. Should there have been no substitute for her camphor developed, it is pointed out that Japan could at a moment's notice cut off the outside world's camphor supply and force every country in the world to buy all of its celluloid products from her.

When the American industries, devoted to the manufacture of products to which camphor is an absolute essential, observed Japan's actions in developing her own use of camphor, forebodings arose. Frantic efforts were made to grow camphor trees in the United States by the United States department of agriculture, the Du Ponts, the Celluloid Company, the Eastmans, but the efforts were unsuccessful. The outlook was not particularly bright.

Then Professor Moore announced his development of a process for making synthetic camphor, but it was such a lengthy and so costly a process that it was not considered commercially practicable. But Professor Moore went back to work.

The result was Professor Moore's complete success, the development of a process which could produce camphor at a minimum cost, easily practicable from a commercial standpoint, and capable of making camphor from the raw products, of which turpentine is the chief, to the finished camphor, in eight hours, accomplishing in that length of time what requires thirty years in Japan.

Synthetic camphor means camphor manufactured in a factory instead of obtained from camphor trees. It analyzes the same as camphor and is declared to be just as good if not better than the natural product for all its uses, especially in making the celluloid type of products, due to the fact that it is free from the natural oils which must otherwise be refined out of the camphor, and it is uniform, which the natural product is not.

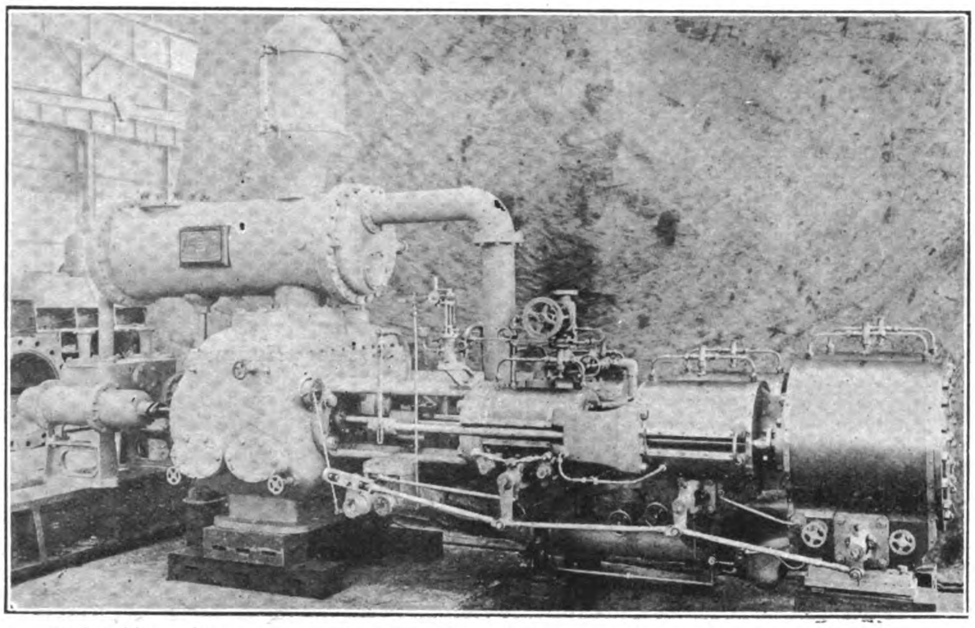
For the purpose of putting Professor Moore's synthetic camphor on the market in commercial quantities the chemical refining syndicate has been formed with a plant in Brooklyn, where the camphor is made from turpentine, which the United States has in abundance.

The engineers' report shows that camphor can be made for less than forty cents a pound. The company's first unit is announced to produce two tons per day, or 1,339,000 pounds per year.

Worthington Triple-Expansion Pumping Engines in China

THE plant of the Shanghai Inland Waterworks was recently augmented by the addition of a Worthington Triple Expansion pumping engine as shown in the accompanying illustration from a photograph taken in the works before shipment to China. This type of engine is a special favorite for waterworks service because of its low first cost, regular construction, simplicity, freedom from breakdown and a low fuel consumption. Similar pumping engines are at work at the Nantao and Canton waterworks in addition to a large number in India and other parts of Eastern Asia.

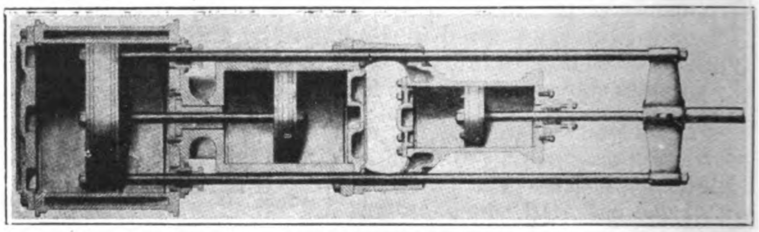
The great advantage of the engine is that it has no flywheel or bearings that are liable to wear and an ingenious arrangement of piston rods are shown on the accompanying illustration. Another advantage is that the engine being duplex double acting, there are four water pulses each revolution and one of these small effect pulses is still further minimised by the plungers being synchronised in such a way that just as one plunger is slowing down for the end of the stroke, the other plunger is just getting up the speed so that the total result is a practically even flow of water from the pump, making this type of pump particularly adapted for pumping into long pipe lines without fear of water hammer bursting the pipes.



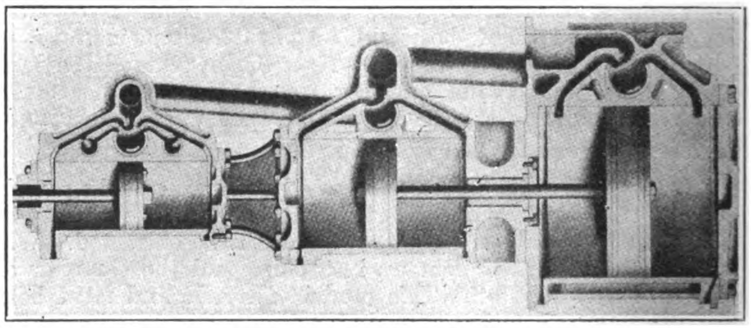
Worthington Triple-Expansion Pumping Engine Installed at the Shanghai Inland Waterworks. Capacity 12,000,000 gallons per 24 hours, against a head of 130 feet

The last engine of this design supplied to the Shanghai Inland City Waterworks was the largest capacity waterworks pumping engine in China and was capable of delivering 12 million gallons of water per 24 hours against a total head of 130-ft. when supplied with steam at 100-lb. pressure.

This engine was of the triple-expansion type with 2—15-in. diameter high-pressure cylinders, 2—23-in. diameter intermediate cylinders, 2—38-in. low-pressure cylinders, 28-in. diameter water cylinder, all with a common stroke of 24-in. Pump end was of the plunger and ring type and was fitted with a surface condenser on the delivery of the pump and attached air pump.



Arrangement of Rods



Sectional View of Steam End

SULZER BROTHERS

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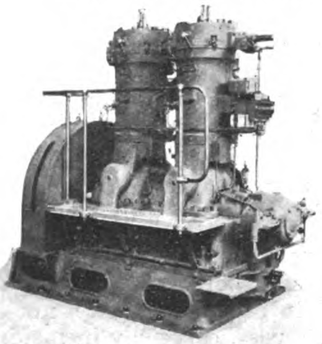
上海愛多亞路四號



80 H.P. 2-cylinder Compressorless Diesel-Engine for Stationary Purposes

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WINTERTHUR. SWITZERLAND.

Hankow Will Have Tramway

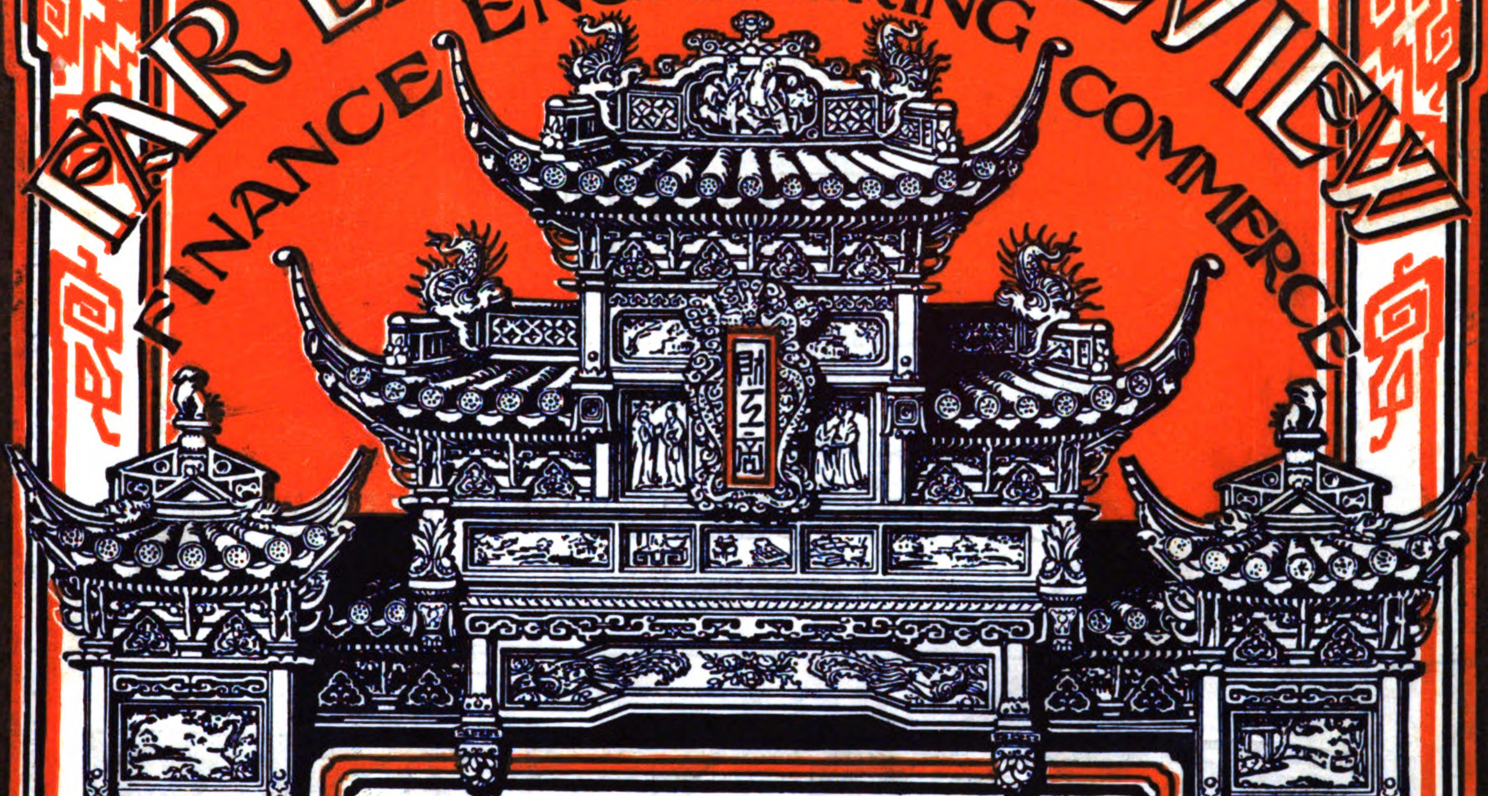
Prominent merchants in Hankow are talking about promoting a tramway company with a preliminary capital of $2,000,000, to operate tram service starting from the bridge, back of the Peking-Hankow railway to Liu Kia-miao, near the Han River, a distance of 50 *li*. Rail-less trams will also be introduced. A plan has been drawn up and submitted for approval at the civil governor's Yamên, Wuchang.

大正七年七月十日第三種郵便物認可

JUN 18 1924

THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE



上海仁記路第五號

遠東時報

"GRAVE CONSEQUENCES"

Japan's Plea for a Nominal Privilege
The Aftermath of Exclusion
American Opinion Scores the Senate

WHAT IS AMERICA AFTER IN THE FAR EAST?
Baron Hikokichi Ijuin

TRAMWAY DEVELOPMENTS IN EASTERN ASIA

ELECTRIC LOCOMOTIVES IN JAPAN
PIPE LINE AT GOPENG
HONGKONG AT WEMBLEY

TAIKOO AND HONGKONG & WHAMPOA DOCKYARDS

SHANGHAI PORTLAND CEMENT WORKS

Vol. XX May, 1924 No. 5

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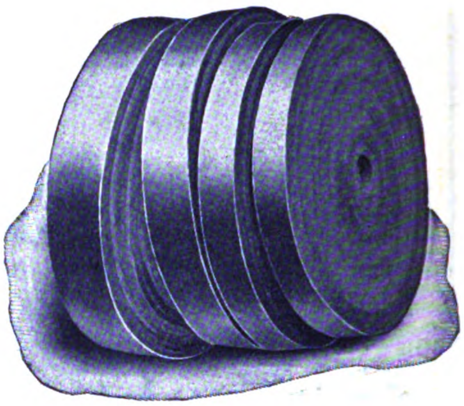

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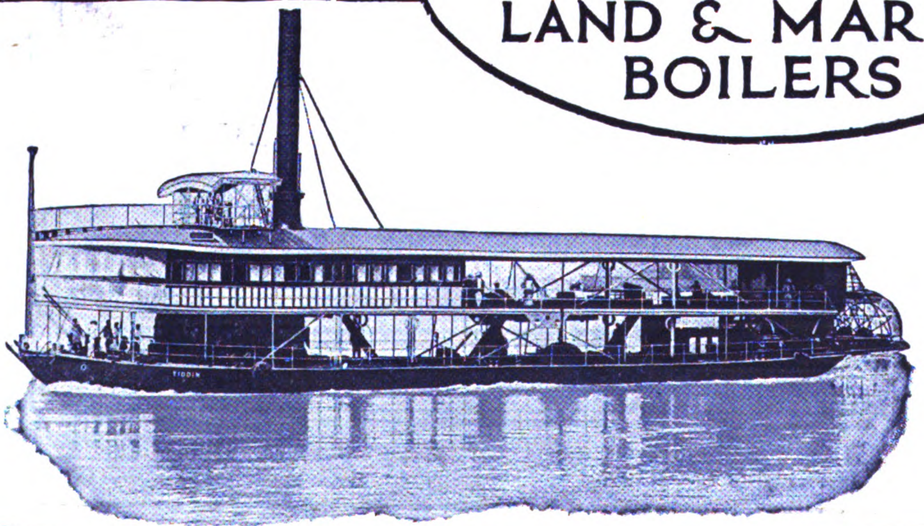


The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, MAY, 1924 No. 5

"Grave Consequences"

" Relying upon the confidence you have been good enough to show me at all times, I have stated or rather repeated all this to you very candidly and in a most friendly spirit, for I realize, as I believe you do, the grave consequences which the enactment of the measure retaining that particular provision *(the Japanese exclusion. Editor)* **would inevitably bring upon the otherwise happy and mutually advantageous relations between our two countries."**

THE words contained in the above extract from a note addressed under date of April 10 to Secretary Hughes by Ambassador Hanihara were interpreted by the American senate as a veiled threat and that august body without more ado passed the bill which definitely excludes Japanese immigrants from the United States even under a quota law which would have preserved their national dignity without material injury to American interests. It required a very sensitive mind to read into the above note an affront after all that had gone before in the relations between Japan and America these past five years. A concealed threat was furthest from the mind of Japan's ambassador and he hastened to correct the wrong impression by an immediate explanation of words which have become associated in diplomatic intercourse as a precursor to hostilities. That such a construction should have been placed on these words after Japan's whole-hearted efforts to gain the good-will and esteem of America would indicate that our legislators are deplorably ignorant of basic Asiatic problems.

Used as a threat, the words " grave consequences " could produce only the effect they did. It was an unfortunate selection of words. " Far reaching " would have sounded better and conveyed the same meaning. No self-respecting government will tolerate outside interference in what it considers a purely domestic question, so when the senate hastened to call what it considered as Japan's bluff, it did what was entirely proper. A better knowledge of present-day Japan and her fundamental problems, however, would have told the senate that far from concealing a threat, Ambassador Hanihara's phrase very mildly pointed to the inevitable aftermath an unwarranted affront to Japan must have on American policies, trade and cultural aspirations in the Far East.

Few of our public men realize the great sacrifices Japan has made to gain our friendship and work with us for the advancement of mutual policies in the Orient. Few understand the pressing population problem of Japan which may drive her in self-defense to seek an independent agreement with China based on the abolition of her extra-territorial rights in this country. This, in itself, is one of the grave consequences that may legitimately follow the application of the Japanese exclusion law. Such action on the part of Japan would hasten the end of the "open door" doctrine, deprive America of that shadowy leadership in China upon which its Far Eastern policies are founded and usher in a new era in Asia. Some one of the great powers must take the initiative in restoring to China full sovereignty over their nationals. Already the edifice of extra-territoriality is tottering. It does not require any great political prescience to sense that if Japan is affronted and rejected by the West and the truth is brought home to her people that they can never hope for full recognition of their claim to equality, a revulsion of feeling will sweep over the empire that must inevitably lead to the formulation of new policies and a new outlook upon the future.

Japan's Ambassador to the United States, Masanao Hanihara, whose open and frank note to Secretary Hughes was interpreted by the Senate as a Veiled Threat

If the West in its might lays down and enforces the doctrine that "East is East and West is West and never the twain shall meet," except in commerce, then the West must not grumble or become alarmed if the East remains East and combines its forces for the preservation of a civilization that is as dear to them as that of the West to the West. When the West bars out the East and then erects barriers in the East which circumscribe the national expansion and legitimate aspirations of any part of the East, the consequences in the long run can only be grave. So, when the West as typified by America, closes its doors to Chinese and Japanese and follows them up in their own legitimate sphere and bars them from the Philippines (teaching one Asiatic that he is better than another) when Japan is obstructed from protecting her vital strategic and economic interests in Manchuria ; when America acts as a self-constituted policeman to keep Japan out of Siberia, while acquiescing in Russia's absorption of Mongolia and expansion in Central Asia, sooner or later the truth will be borne home to the East that the issue disguised for the present under economic exclusion laws is in reality an intense racial hatred based on cultural, religious and color lines.

The effect of all this will be to unite China and Japan for the preservation of their common civilization and their right to

exist. The West, represented by America, overlooks the real China. It forgets the Chinese are as proud and haughty as they ever were in the old exclusion days of the Manchus. It ignores that the Chinese are nursing the same grievance as Japan, deeply resenting the indignities heaped upon their travelers by the rigid application of Western exclusion laws. Any American who cherishes the idea that by forcing philanthropies upon the Chinese we will drive a wedge between the two great Oriental nations, is a fit inmate for the insane asylum. There are few differences between the Chinese and Japanese that cannot be readily compounded. China's so-called national humiliation day has already lost its significance. The two nations cannot always be kept apart.

Dr. Sun Yat-sen knows China and speaks for a vast percentage of his people. Discussing Japanese policies towards China, he recently told the writer:

"I am a friend and admirer of Japan. The Chinese look upon Japan as a younger brother who has strayed from the older civilization in order to court favor and prestige from the West. The West has accorded her the rank of a first class world power, and instead of standing by their elder brother in his struggles to advance, Japan has aligned herself with his enemies. Some day, Japan will be disillusioned and turn to that brother she has injured and left behind in the race for power. When that day arrives and Japan returns to the family prepared to work in harmony with it, all will be forgiven."

Baron K. Matsui, Japan's Minister for Foreign Affairs

Viscount K. Kiyoura, Japan's Prime Minister, who accepts full responsibility for Ambassador Hanihara's much criticized note to Secretary Hughes

Dr. Sun may be a dreamer but his dreams have an uncanny habit of coming true. The day when the younger brother of China will return to the family he has out-distanced in the race for power, is brought appreciably nearer by the enactment of the American exclusion law. The union of China and Japan for the preservation of their common civilization and right to exist is an inevitable as the rising of the sun in the East. If these consequences convey a threat to the West, the latter has only itself to blame.

Japan has already decided upon her future attitude towards China. No longer will she act as the policeman of the powers for the protection of foreign interests in this country. Never again will she be placed in the position of infringing China's sovereignty or of taking any initiative that may lead to intervention in her affairs. She has her own plans for the development of cultural relations with China and only continued unrest in this country has retarded their being placed into practice.

In carrying out this cultural program, the two nations will become spiritually united and facilitate co-operation in material undertakings. Japan's civilization had its source in China and it is with a hope that the two peoples will once more become united for the preservation of common ideals that Japan is now willing to remit her share of the Boxer indemnity for schools, colleges, hospitals, libraries and the expenses of maintaining Chinese students in Tokyo. The idea of co-existence and co-prosperity is to be inculcated in the minds of the Chinese who are ready to acclaim Japan as a brother on whom they can rely to stand with them in the joint labors of developing anew that civilization which at one time dominated the world. It may never again rule the world, but it is a foregone conclusion that in due time it will be paramount in its own sphere.

If this means anything at all, it means an end to America's aspirations to spiritual leadership in China; the end of the "open door" doctrine; an intensification of the struggle for trade opportunities; the revival of jealousies, friction and hatred that will undo the work of the Washington conference. Our contributions for uplift work in China will go for naught. All this will not come about in a day or a year. Japan will remain a friend of America. New parties will come into power and new policies supplant those now in force, but down deep in the heart of every Japanese will rankle the knowledge that Americans have classed them as inferiors unfit to enter their great country on a basis of equality with other peoples far less desirable than they. It may be many years before America, like Germany and Russia, will be reminded of the insult. How and when that opportunity will arise, only the future will disclose, but it will be done in a manner as firmly and politely as we are now rubbing it in to Japan. But come it will, and on Japan's willingness to forget the affront may hinge the future of Western civilization.

G. B. R.

Japan's Plea for a Nominal Privilege

Friendship With America Impaired but Not Broken

IN order to clearly understand how mistaken is the interpretation placed on Ambassador Hanihara's note to the secretary of state by the senate, it is only necessary to go back to other Japanese official statements regarding the immigration issue. Ambassador Hanihara's note was dated April 10. Read the following statement given to the Associated Press by Baron Matsui on February 7:—"Japan's continued development and security, in a large measure," he says "depend upon the maintenance of good relations with the United States—as well as others. This is not only a present and temporary need but one that Japan will require as far as we can see into the future." Such words from Japan's foreign minister adequately interpret her real sentiments.

BARON MATSUI TO THE ASSOCIATED PRESS, FEBRUARY 7, 1924.

"Of course, we are disturbed over the increasing restrictions put upon Japanese residents in the United States and the proposals at present before congress for the further exclusion of Japanese. Discriminatory and seemingly relentless opposition on the part of some Americans to the presence of a comparatively small number of our people is difficult for us to understand, and hard for us to reconcile either with our own sense of proper dignity or our appreciation of the fine principles for which the American people generally stand."

"Being particularly anxious for American good-will, we have gone a long way in many matters to meet the American point of view. Apart from any sentiment that we have, we fully realize that accord and understanding with the United States are of incalculable value. Our continued development and security, in a large measure, depend upon the maintenance of good relations with your country, as well as others; and this is not only a present and temporary need but one that Japan will require as far as we can see into the future. Here we live by overseas trade, and the United States is at once our greatest customer and our greatest source of supplies."

"In the wisdom of this policy of close understanding and co-operation our whole country concurs; and, in the notably good developments that have been achieved between us in the last few years, Japan is overwhelmingly gratified. Moreover, our hearts have been touched deeply and enduringly by the spontaneous sympathy and extensive generosity your people displayed towards ours after our recent terrible earthquake and fire. We have only this one regrettable issue between us, and it is an issue in which we have never been arb'trary, and do not now intend to make any unreasonable demand. We seek only to obtain fair treatment and humane consideration for a group of our people legitimately residing in your country; and this is no more than any self-respecting nation would do. The question of emigration from Japan to the United States has been definitely decided. For a number of years, knowing that our people were not wanted as immigrants, we have issued no passports except to the immediate relatives of those Japanese who have been long residents in the United States; and, in our opinion, this is a mere matter of humane consideration for the family rights of men. If this is deemed unsatisfactory, we are ready to discuss the matter anew. Restrictions or exclusions should be arranged by mutual consideration, consent, and agreement, as is customary, and not by needlessly arbitrary and *ex parte* action."

"Our foreign policies are obvious and well known to any who will observe and understand them, and our intentions in this special case are so conciliatory and well-meaning that we could only deem it an unnecessary lack of consideration if no heed is paid to our desire to be treated on the footing of other independent nations who are likewise playing important and valuable parts in the welfare and progress of mankind and in the maintenance of world peace."

Japan's Sacrifices for Friendship

Two months later, on April 15, Baron Matsui gave another interview to the American newspaper correspondents in Tokyo and once more voiced the universal feeling in Japan towards the proposal to exclude Japanese from entering the United States on a plane of equality with other nations. One point stands out clearly. "*For many years and sometimes at considerable sacrifice, we Japanese, both in government circles and privately, have made the utmost effort to develop friendship with the United States.*" That is a true statement, one which is reflected in the trade returns which show that Japan is the greatest purchaser of our products in Asia, greater than all other countries in the Far East combined. Some Americans like to fancy that there is nothing extraordinary in this, that they have the goods quote the lowest prices and therefore receive the orders. It would surprise them to learn of the many large orders that have gone to America out of pure sentiment, in order to gain its good-will.

In this statement, Baron, Matsui points out a truth that also is overlooked by many. The United States in her present position of wealth and power are privileged to take arbitrary action or behave with fine magnanimity. We can insult at this time whom we will with impunity, but we cannot wipe out resentment with fine words and phrases. The insult will rankle and even though for as many years as we can see into the future, Japan will carry on a relationship that means economic life or death to her, always hoping for some action that will wipe out the affront to her dignity, some day in some way she will return the compliment.

BARON MATSUI TO NEWSPAPER CORRESPONDENTS, APRIL 15, 1924.

"There is not much that I can say in complying with various requests for an interview. But this I want to do; I want to appeal against the final passage of the proposal designed to exclude Japanese. For many years and sometimes at considerable sacrifice we Japanese, both in government circles and privately, have made the utmost effort to develop friendship with the United States. We have never given up hope or belief that this very clear and worthy policy would be successful: nor have we given up now. Now, however, we have cause for grave anxiety, and it is for that reason that I make this appeal through you gentlemen of the American press. It seems to us that we are appealing only against an action that can wound us to some extent and can bring little satisfaction to you."

"There can be little doubt that if the quota provision is operated by American authorities on your side and the gentlemen's agreement is operated by us here, the most effective control over emigration will be provided. The choosing of those few of our people who would thus be permitted in future to go to American shores, the restraining of others, and the effecting of this supervision with the least possible irritation to either side is valuable assistance which we have to offer. Such an arrangement would maintain that mutual confidence, respect, and good-will which now exists and which we, as a nation as well as a government, are most anxious to retain and to continue successfully to promote."

"It is certainly of practical and we hope mutual benefit to keep our nations in friendly accord rather than in agreement based only on mutual interests. Our interests are closely linked with yours. You are our greatest customer, taking about forty per cent. of our annual exports, and we are a greater purchaser of your goods than all the rest of the Far East combined. This, together with our mutual political and sentimental interests in the stability and security of the Pacific nations, forms a relationship that cannot be broken; and to maintain it with greater and not with minor mutual regard is our earnest desire."

"Being the most wealthy and most secure among the nations, the United States is regarded with careful attention by the East no less than by the West. You are in the enviable position of a power privileged to take arbitrary action or to behave with fine magnanimity, setting an example to other nations or inducing their resentment. Because of your teachings in the mission fields of the East you have come to be highly regarded as one of the greater Christian nations. Within recent years we in Japan have been deeply affected by two notable actions on your part: First, the proposal to limit naval armament, an offer which you alone could make to the world out of your supremacy; secondly, the splendid and spontaneous sympathy which you displayed towards us at the time of our recent awful disaster."

"If now we get from you an experience of a different character, it will undo some of that spirit of friendship and esteem in which we have been happy long to regard you. It can do no more than this: but with a nation of the character of yours, the regard of others is, we believe, a consideration of no mean importance."

Japan Asks Only a Concession

The day following Baron Matsui's frank exposition of Japan's viewpoint, the prime minister gave an interview to the newspaper correspondents in Tokyo, in which he pleaded for a nominal privilege, a concession to Japan's pride that will preserve her face amongst the nations of the world. In it, he touches on a point which throws the lime-light on the handicaps which confront Japan in making her case clear in a language which few Japanese are proficient enough in to express their thoughts. It has always been one of the weak spots in Japan's much criticized publicity methods. An ingrained reticence, the result of centuries of feudal life, cannot be discarded in a generation or so. Viscount Kiyoura is right when he asks indulgence for this trait in the Japanese character. It is difficult, however, to see how the Japanese could have made their case any clearer.

THE PRIME MINISTER TO NEWSPAPER CORRESPONDENTS, ARPIL 16, 1924.

"My regret is, of course, deep that the congress of the United States has seen fit to deal with us Japanese so drastically. It seems to us hardly to have been necessary in view of the fact that our whole history has shown us willing to be reasonable. We were willing to accept only a nominal privilege. If

we have not made this clear in a language which is foreign to us, we have at any rate shown it by that long record of action and of friendship which may now be impaired but cannot be broken. The right of the United States to arrange its own immigration is not disputed by us. We asked only for a concession. If this is denfed us, we shall regret it, because we had hoped for a further act of consideration to be added to the several which your nation has shown us on former occasions. You gave us moral and financial support in the greatest crisis in our history and you gave us impressive sympathy in our greatest disaster. These things we shall not forget."

Senate Rejects Open Diplomacy

Probably in the long history of diplomacy there has never been recorded a more sincere regret for an error of speech than the note addressed to Secretary Hughes by Ambassador Hanihara on April 17. In it, he explains what he meant by the words "grave consequences," and when one is able to read between the lines and grasp all that an impairment of the mutual regard and confidence between Japan and America signifies, it must be confessed that the Japanese ambassador did not express himself forcibly enough. We have asked and fought for open diplomacy, yet when diplomatic intercourse is carried on in a spirit of sincere respect, confidence and candor, our Senate, which should be the last legislative body in the world to jump to hasty conclusions, seizes on frank statements in order to justify an affront that is daily becoming more evident was intended from the first.

It is significant that the secretary of state saw no offense in the wording of Ambassador Hanihara's note. It was only when this document reached the senate that a veiled threat was discovered in its wording, all of which goes to emphasize that post-war open diplomacy as conducted by the department of state is as yet incomprehensible to a group of legislators whose minds still function along lines peculiar to those whose usefulness reached its climax two generations ago.

NOTE ADDRESSED TO SECRETARY OF STATE HUGHES BY AMBASSADOR HANIHARA ON APRIL 17.

"In reading the congressional record of April 14, 1924, I find that the letter I addressed to you on April 10, a copy of which you sent to the chairman of the senate committee on immigration, was made a subject of discussion in the senate."

"In the record it is reported that some of the senators expressed the opinion which was apparently accepted by many other members of that body that my letter contained 'a veiled threat.' As it appears from the record that it is the phrase 'grave consequences' which I used in the concluding part of my letter that some of the senators construed as 'a veiled threat,' I may be permitted to quote here full text of the sentence which contained the words in question."

"Relying upon the confidence you have been good enough to show me at all times, I have stated or rather repeated all this to you very candidly and in a most friendly spirit, for I realize, as I believe you do, that grave consequences which the enactment of the measure retaining that particular provision would inevitably bring upon the otherwise happy and mutually advantageous relations between our two countries."

"Frankly I must say I am unable to understand how the two words read in their context could be construed as meaning anything like a threat. I simply tried to emphasize the most unfortunate and deplorable effect upon our traditional friendship which might result from the adoption of a particular clause in the proposed measure. It would seriously impair the good and mutually helpful relationship and disturb the spirit of mutual regard and confidence whatever characterizes our intercourse of the last three-quarters of a century and which was considerably strengthened by the Washington conference, as well as by the most magnanimous sympathy shown by your people in the recent calamity in my country. 'Whereas there is otherwise every promise of hearty co-operation between Japan and the United States of America which is believed to be essential to the welfare not only of themselves but of the rest of the world it would create or at least tend to create an unhappy atmosphere of ill-feeling and misgiving over the relations between our two countries."

"As the representative of my country whose supreme duty is to maintain and if possible to draw still closer the bond of friendship so happily existing between our two peoples;, I honestly believe such effects as I have described to be 'grave consequences.' In using these words which I did quite ingenuously, I had no thought of being in any way disagreeable or discourteous and still less of conveying 'a veiled threat.' On the contrary, it was in a spirit of the most sincere respect, confidence and candor that I used these words which spirit I hope is manifest throughout my entire letter; for it was in that spirit that I wrote you. I never suspected that these words used as I used them would ever afford an occasion for such comment or interpretation as has been given them.

"You know I am sure that nothing could be farther from my thought than to give cause for offence to your people or their government and I have not the slightest doubt that you have no such misunderstanding as to either the spirit in which I wrote the letter in question to you or the meaning I intended for the phrase that I used.

In view, however, of what has transpired in the course of the public discussion in the senate, I feel constrained to write you as a matter of record that I did not use the phrase in question in such sense as has been attributed to it.

REPLY OF SECRETARY OF STATE HUGHES TO AMBASSADOR HANIHARA ON APRIL 18.

"I am gratified to receive your letter of the 17th instant with your frank and friendly explanation of the intent of your recent note in relation to the pending immigration bill."

"It gives me pleasure to be able to assure you that reading the words 'grave consequences' in the light of their context, and knowing the spirit of friendship and understanding you have always manifested in our long association, I had no doubt that these words were to be taken in the sense you have stated, and I was quite sure that it was far from your thought to express or imply any threat. I am happy to add that I have deeply appreciated your constant desire to promote the most cordial relations between the peoples of the two countries."

The American secretary of state, the American ambassador at Tokyo, the president of the United States and other powerful influences throughout the country have labored to the best of their ability to preserve unimpaired that spirit of mutual regard between the two countries upon which depends to such a large extent the success of American policies in this part of the world, but the senate, prodded by Pacific coast interests, seems determined to carry out its idea of Asiatic exclusion without regard to the feelings of Japan. We can affront Japan at this time and salve our consciences that we are compelled to take drastic action in order to preserve our ideas of sovereignty embraced in the right to say who may or may not enter our country. We may be well within our right. There is no question about this. The real question will arise when we least expect it. Common courtesy to Japan at this time may find her on our side when the more vital issue has to be faced.

The Aftermath of Exclusion

EXCLUSION of Japanese from the United States will take effect from July first. Japan's pleas for a mere concession that in no way minimized the object of our new immigration laws have fallen on deaf ears in Washington. America with her great wealth, secure position and immense power has stood firmly on its sovereign rights to legislate against the further influx of Asiatics. To protect the economic life of California against the menace implied by the entrance of 250 more Japanese annually, the American government is willing to deprive thousands of skilled workmen in its Eastern and Middle Western factories of a livelihood they now enjoy from the sales of their products to Japan. Our best steel market outside of Canada is Japan. Our best machinery market is in Japan. Blind to the real economics involved in the issue, America is making a present of its growing trade with Japan to European competitors.

Many important Japanese orders for American products have been cancelled in anticipation of the passage of the exclusion law. It is safe to predict that many similar cancellations will follow. European manufacturers have been keenly watching the situation prepared to take advantage of any revulsion of feeling towards the United States. The senate has played into their hands. Official Japan and her broader-minded financiers and merchants retain the hope that the affront will be mitigated by some new agreement that will maintain their national dignity. The great masses of Japan, however, accept exclusion from America as an accomplished fact.

Let us recapitulate. The doors of the West are closed to Asiatics. The millions of Japan must seek their future in Asia. American policies in the Philippines, in China and in Siberia, in addition to extra-territorial principles in China hamper Japan's struggles to find a peaceable solution to her problems. A ringed fence has been built up around Japan which in the end must keep her children at home. Here they must live and to live must work to earn the money to buy bread with.

Japan must have bread—or rice if you like—and she cannot produce it all at home. She must turn to China, to Manchuria, for her vital food supplies, but here America steps in with her ideas of equal opportunity that hampers the free development of the one part of China in which Japan's economic future is at stake. Japan, unlike the western nations, is not a meat eater. She does eat fish. It is her staple article of food. The Okhotsk Sea is to Japan what the great grazing grounds of the western states are to the people of America. Yet, it was only a few years ago that our secretary of state stood beside Russia in questioning the right of Japan to fish in these waters, a right conferred upon Japan by the provisions of the Portsmouth treaty.

The preservation of our rights to trade, the maintenance of our philanthropies in China and the future of the Soviet in Siberia are of greater importance to the United States than the mere matter of daily bread to the workers of Japan. How long do we think the Japanese will tolerate the application of idealistic diplomacy while their future existence is being slowly but surely undermined ?

How long will it take for the Chinese and Japanese to come together ? How long will it be before America's pocket is touched and it pays in dollars and cents for its policies towards Asia ? For the present, perhaps, America can afford to disregard the essentials which make for economic prosperity through foreign trade. It can continue for many years to come to play the rôle of disinterested world philanthropist. Its wonderful prosperity and boundless wealth will for a long time stand the drain of millions devoted to uplift work in China. It can still continue to pay out two dollars in charity for every dollar earned in Chinese trade. It may be that philanthrophy as our main business in China will pay handsomely in the long run ; that future generations of grateful Celestials will recall the huge sums expended for the spiritual and social uplift of their ancestors and align them with us in any future world crisis. All this may come true. The Chinese have a great respect for their ancestors, but the present generation of American traders and manufacturers who are working against the greatest handicaps to establish their position in China, will not profit by it.

Let us look the situation calmly in the face. The news of the application of the Japanese exclusion act had hardly reached the Far East when the movement for a closer Sino-Japanese understanding was in full swing. China's national " Humiliation Day," a yearly reminder suggested by foreign advisers to keep alive the animosity engendered over the twenty-one demands, passed off without an incident worth noting. The Hankow chamber of commerce, formerly one of the most rabid anti-Japanese bodies, not only passed a resolution in opposition to any demonstration on humiliation day but came out openly against further anti-Japanese agitation. Chinese students in Tokyo called on the minister of foreign affairs to tell him that Asiatics must stand together. Many Chinese editors and high officials have voiced the same sentiments. The Chinese minister to Tokyo declares that the American exclusion act is directed against the peoples of a whole continent and is wholeheartedly in favor of Japan's extensive program for the development of cultural relations between the two countries. In fact, the first tendency is exactly as we have predicted. Chinese and Japanese have been driven together in a common cause to fight the insult and humiliation hurled at Asiatic people in general by America.

America has wilfully invited the consequences so mildly mentioned by Amabssador Hanihara and sensed at once by the intelligent mind of Secretary Hughes. We have done a service for Japan that otherwise would have been costly and difficult for her do by herself. The remission of the Boxer indemnity balance immediately after the passage of the exclusion act will have no effect in retaining the good-will of China. Charity does not wipe out an affront.

The Japan Times sums up the situation in the following words :

" China seems to have begun to think exactly as Japan is thinking in regard to the unfortunate development in America. Congress is, it may be said, driving China to reconciliation with Japan, a turn of affairs, which no Japanese endeavors as such would have been able to bring about. That Japan and China should go hand in hand is in the order of things perfectly natural, but there have been Americans who would even give their lives to keep the two peoples ever increasingly in loggerheads.

We are not sorry that the supreme endeavors of these Americans are being doomed to failure through actions of their own congress. We hail, indeed, with boundless delight, indications that the right vein of thinking with respect to this country is becoming evident in China."

Up to Coolidge?

The Crucial Test of His Character

American Opinion Scores the Senate

AS was to be expected, the sober common sense of the American people has been outraged by the senate's precipitate and almost unanimous vote on the immigration bill. Perhaps never in our history has there been such a violent revulsion of feeling accompanied with such bitter and scathing criticisms hurled at the senate by the editors of the most important exponents of American public opinion. In effect, it is becoming increasingly evident that senatorial intervention in the conduct of our foreign relations which the constitution imposes on the president and the secretary of state is becoming more and more unpopular.

The New York World minces no words but calls the senate a mob. " The country," it says " will not look back with pride upon the senate's behavior, for it was animated by the lowest passion of a mere mob." The incident, it adds

" is merely the climax to five years of truculent aggression by the senate which has done immeasurable harm to the people of the United States. For in those five years the senate has not only paralyzed the executive ; it has gone out of its way to offend foreign nations. The time has come for the American people to see themselves as others see them, to understand their position in the world and to insist that their government act with that dignity and restraint which is the obligation of great power."

The most scathing rebuke comes from *The New York Sun* which enlarges on Japan's consistent course to gain the good will of America, her co-operation in making the Washington conference a success and her loyalty in carrying out its provisions with a promptness that put some European powers to shame. *The Sun* then sums up the situation in its true aspect when it draws attention to the fact that after stripping Japan of her advantages and weakening her power for defense we play the rôle of the bully and wantonly insult her. It says :

" It may not be fully realized how real were the sacrifices Japan made at the Washington conference. She was called upon to accept a 5-5-3 ratio in capital ships which seemed to her unfair ; yet after protesting that it should be 5-5-3½ she gracefully yielded. Although Japan has a population that is pressing to the utmost upon her food and industrial resources, and needs room for territorial expansion, she consented to a series of far-reaching evacuations. She agreed to get out of Siberia and finished the removal of her troops in October, 1922. Simultaneously she gave up her hold on Shantung. The Anglo-Japanese treaty was abrogated. Does the senate wish oo put America

in the position of stripping Japan of her defensive advantages, and then insulting her ?"

The New York Times lives up to its reputation as one of the best informed newspapers on Pacific affairs by pointing out that the senate's rudeness and intemperance coming as the culmination of a long series of actions which the Japanese have considered as affronts to their dignity and racial pride, cannot but intensify the hatred of Americans by the Japanese. Thus one hour may undo the work of many years of diplomacy.

"Nothing more clearly shows how unwise it would be to yield to the senate that exclusive conduct of our foreign relations which some of its members arrogantly claim. Nothing better answers those senatorial critics who ignore the constitutional provisions giving the president the power to conduct negotiations with foreign nations. It was both a surprise and a humiliation to the country that not one of the senators was cool-headed or brave enough to call upon his colleagues to pause and consider the effect of their action. Not even the veteran senator from Massachusetts, a man long experienced in the vicissitudes of foreign affairs, had the courage to call the attention of the senate to the fact that Japan did not question the right of the American government to limit immigration as it sees fit. No one stopped to emphasize the passage in Mr. Hanihara's letter which expressed the willingness of the Japanese government to discuss modifications of the 'gentlemen's agreement.'

"Instead, the senate cast responsibility to the winds and showed itself willing to sow the seeds of future wars in order to rebuke a fancied present threat. Such bull-in-the-china-shop tactics are as disconcerting to Americans as to foreigners. National susceptibilities cannot be petulantly trifled with. Fair play and common courtesy make it incumbent upon congress, in considering the final draft of the immigration measure, to reconsider the Japanese exclusion provision and to act, not with a desire to vent its august displeasure, but with a view to the national and international interests involved."

The New York Tribune says that the American people have no desire to insult Japan and it was childish on the part of the senate to slam the door in Japan's face because it dectected a threat of some sort in two elastic words of a long communication.

"Of the sovereign power of the United States to regulate its own immigration laws there has been no question and there will be none. But the sovereignty of a great nation confident of its power surely does not need to be asserted with the gesture of a bully. In hunting afar for an insult and torturing language to find it the senators have acted like the legislators of a fourth-rate power. The sooner they return to American standards of dignity and self-respect the better."

The Wall Street Journal speaking for the great financial interests of the country reflects the thoughts of many serious-minded people who have followed the senate's activities ever since it was played upon by a group of Chinese propagandists to break the Versailles treaty through the Shantung decision. It has been said that Senator Lodge and a few of his colleagues have never forgiven Japan for getting out of Shantung. It would help to explain their present wholly inexplicable conduct. *The Wall Street Journal* declares that

"For a number of years past the United States senate has been declining, in prestige and public confidence. It might be possible, if the point were worth arguing, to date this deterioration from the popular election of senators, but the fact is beyond dispute. Less than twenty years ago, even ten years ago, there were forty members of the senate the equals or superiors of the best man there to-day, and incalculably superior in what may be called national spirit, unselfish appreciation of principle and contempt for petty politics.

"To-day the senate is laboring under what is super-scientifically called an inferiority complex. If it were really sure of its authority it would not be everlastingly parading it, in season and out. Its assertions of its powers and scope lack dignity.

"In such circumstances what more natural than that the senate should start a cheap quarrel with Japan in order to unite public opinion once more behind it, on the plea of patriotism ? This has been the dangerous device of incompetent rulers since history began.

"This continual meddling in foreign affairs, with the assertion of powers in foreign relations which the constitution of the United States never gave, is not a proof of strength but of weakness. It can only happen in a body which has ceased to be sure of itself."

The New York Evening World says the same thing in another way:

"The childish petulence of the senate in repudiating the gentleman's agreement with Japan in a moment of flamboyant bellicosity is in keeping with its stupid performances in foreign affairs during the last five years. Senators are only interested in foreign affairs in so far as they furnish an opportunity for politics and demagogy. The spectacle staged on Monday was for the benefit of the voters of California.

"But the senate, with the complacency of the brutal braggart of a bo who has killed a kitten or smashed a window, is pleased with itself. It has accentuated a problem. It has interfered with the amicable negotiations of the foreign offices in Washington and Tokio. It has given every demagogue and war-monger in Japan and the United States dangerous fireworks of the kind from which come conflagrations. It has treated an agreement entered into by the United States as a scrap of paper. And all this to prevent 240 Japanese from entering the country annually !

"It is stupid—and it is characteristic."

The Philadelphia Bulletin says :

"The vital questions were those of diplomatic relations, and the result of yesterday's jingoism was to make harder the task of the president and the secretary of state in maintaining, not merely the peace of the Pacific, but the international friendship which underlies and underwrites that peace."

The New York Post harps on the same theme and says :

"Any sensible person realizes that Japan to-day is in no position to engage in a major war with such a power as the United States. It would be courting disaster and ruin. But the senators saw in the term a 'veiled threat' and made the most of it. They assumed their touchiest mood and climbed to the top rung of their dignity. They succeeded in making themselves appear extremely undignified, like small boys with chips on their shoulders.

"The United States is a giant in strength, and the world fully realizes it. It is about time we grew up mentally and morally to our physical stature. Instead, the senate makes itself ridiculous.

"Many persons resent the dictatorial attitude the senate has assumed toward President Coolidge and Secretary Hughes. The intelligent opinion of the country would support the president if he should see fit to veto the immigration bill, the terms of which would embroil him and the country in serious and stupid difficulties. The men we elect to regulate our foreign policy after all deserve some consideration."

The New York Tribune supplemented its first editorial quoted above, by adding :

"Whatever else the senate does with the immigration bill, it should strike out the obnoxious provision that humiliates Japan. It is a wretched exhibition of jingoism for senators in a mood of petulance to jeopardize the work of the Washington conference."

It follows this up by saying :

"Doubtless the United States is in a position to affront Japan or any other nation of smaller stature ; but the bully does not cut a pleasing figure among men or nations."

The New York Times further condemning the senate's hasty action says :

"Hasty and intemperate legislative action merely serves to rekindle the deep fires of race hatred and to undo the work of a quarter of a century of diplomacy. Even if later repaired, the damage is incalculable. In this instance the blame cannot fairly be said to rest on Japan, which has consistently shown great forebearance in the presence of our American jingoes."

The New York Telegram regrets that

"The senate, as the custodian of foreign reations, refused to take the Japanese protest with the seriousness it deserved."

Many papers recognize that the senate did only what it should have done in the face of a threat on the part of another country, but ignore conditions existing in Japan which make such a conclusion ridiculous. *The Brooklyn Standard Union* seems to think that Ambassador Hanihara who holds his post because of his ability to say the right thing at the right time, "spilled the beans," by giving the senate something to hang on him. It, however, recognizes that the rest of the note qualifies the "veiled threat," and that being so "the senate will perhaps cool off and let gentlemanly agreements take the place of temperamental outbursts."

The New York World, however, brings up the real question that now takes precedence over all others in this controversy by speculating on whether or no President Coolidge will live up to his reputation for firmness of character and veto the bill, thus inviting the political opposition of the Pacific coast states to his nomination for the presidency in the coming convention. It says :

"The measure is unnecessary. It is brutal. It is dangerous. It does not cater to any real necessity of the Pacific coast and it does not represent the real will of the American people.

"If congress, in a fit of pique, insists on acting frivolously in a grave matter of this sort, the country will expect the president, by his veto, to save it from the consequences of this folly. It will look particularly to Mr. Hughes, whose fame as secretary of state rests upon his accomplishments for peace in the Pacific, not to allow all he has achieved to be destroyed."

At the height of the controversy, Secretary Hughes opened the republican polictical campaignin New York in a keynote speech, which, in effect, said that Coolidge, the man, is the party's platform. "The best assurance of the future is the character of Calvin Coolidge."

The New York World accepts the challenge and the following morning puts the whole immigration rumpus up to the president.

"If characters are to count in the coming campaign, the character of Mr. Coolidge is to be put to a severe practical test, as in passing the exclusion act congress has confronted the president with a choice between duty and expediency.

"Mr. Coolidge's duty is to stand by Secretary Hughes and veto the exclusion act.

"Mr. Coolidge's political interests call for acceptance of the exclusion act in order not to alienate the Pacific coast states.

"On the side of a veto are honor and loyalty to the best interests of the American people. On the side of approval is the tempter's argument that

congress would override the veto, that nothing is therefore to be gained by it, and that valuable electoral votes would be lost by it. It is an argument which might appeal to some of the president's advisers. It is an argument to which a man of character would not yield.

"After Secretary Hughes's hearty and, we think, wholly sincere testimony, it cannot be assumed, without positive proof to the contrary, that Mr. Coolidge will fail to veto, or that he has abdicated all claim to leadership of his party."

We are inclined to take the viewpoint of *The New York World* in that the crucial test of President Coolidge's character will arise when the exclusion bill comes before him for signature. We believe that duty rather than expediency will guide him at the last. If he listens to party politics and signs the bill in order to placate the Pacific coast, he undermines the one great constructive work of the Harding administration, the Washington conference, and the democrats will get him on this point. His only salvation is a strict adherance to duty. VETO THE BILL!

Altruism *versus* Horse Sense

What is America After in The Far East?

A Comparison of American and Japanese Colonial Policies

AN article by Mr. Ralston Hayden on Japan's New Policy in Korea and Formosa appearing in the last number of "Foreign Affairs" compels attention not only for the unbiassed manner in which he handles a difficult subject but for the comparison between altruism as exemplified by the application of American methods in the Philippines and the more practical colonial policies of Japan which have brought economic benefits and prosperity at the expense of social and political uplift.

Mr. Hayden's valuable contribution brings out forcibly the verdict that no matter which of the two policies are adopted and applied, the effect upon their beneficiaries remain the same. Law and order, economic prosperity, elevated standards of living and widespread education in Korea and Formosa have not wiped out the rising tide of political discontent evidenced in a desire for a larger share in their own government by the governed. A large part of the people in both colonies are still hoping and praying, intrigueing and moving heaven and earth to achieve their independence. However, they are being pressed hard by the rising generation which sees things in a different light, and with continued prosperity, preservation of law and order and other guarantees of individual rights, as time goes on the new element will crowd out the old die-hards and assimilate with their rulers. They have a firm foundation of economic prosperity and now demand a larger participation in the administration of their own affairs. This, the Japanese government is trying to give them.

In the Philippines, after twenty-five years of altruistic rule catering to the purely social and political betterment of the native, elevating them to the level of their tutors at a sacrifice of their material well-being, we find instead of gratitude, an insistent demand for immediate independence. American methods in the Philippines have simply created another South American state, in which with all avenues for industrial development closed, the graduates of the many schools and colleges have taken to politics as a duck does to water. Educated far beyond the requirements of the industrial life of the country and with no place to put into practice the learning acquired, it is natural for these high-collar graduates to seek government jobs. Had they been provided with an opportunity to work through the development of insular resources hand in hand with cultural progress, the Philippines to-day would have been in a better position to embark on an independent adventure.

For the present at least the Japanese program, despite its initial mistakes and harshness, has brought economic prosperity and physical contentment to the people of Formosa and Korea, a good ground for further uplift work. They can now stand on their own bottom without help from the Metropolis. They have established a solid foundation on which to erect a political superstructure that will endure. In the Philippines these conditions are reversed. An economic foundation that will bear the weight of political independence is lacking. American concern for the future of their wards and an overzealous desire to protect them from spoliation has prevented the free influx of capital and labor to develop their resources. What prosperity they enjoy is derived from the remission of American duties on sugar and tobacco, a free gift from the American treasury. Take away this favored tariff position by conceding independence and there remains no foundation on which to erect a lasting political edifice. To maintain their independence and provide the funds to keep their heads above water as a going concern, the doors of an independent Filipino republic will have to be opened to Chinese and Japanese labor and capital. They will have to start at the bottom of the economic ladder and even under the most favorable conditions, it will take them another two or three decades to arrive where Formosa is to-day.

With a population of 3,500,000, the annual income of the Formosan government is about $50,000,000 gold while the Philippine government exercising jurisdiction over 11,500,000 people, ekes out an existence with revenues totalling about $32,000,000. With the vastly superior natural resources of the islands and working under a program similar to Japan's in Formosa the insular revenues should now be $150,000,000, or even more. As a purely commercial and economic proposition the Japanese program has benefitted Formosa five times as much as the application of American ideals in the Philippines.

Politically, the Filipinos have been educated until they can stand alone. The sweeping demands for independence now voiced by all factions and parties is an indication that the *politicos* are seeking some way in which they can create an economic prosperity and provide occupations for the educated classes. The laws as they now stand maintain the islands closed to capital, closed to labor and closed, therefore, to economic development. We have fed them cake when they cried for bread. They are surfeited with sweets and want something more substantial. They seek this through complete independence, starting their new life well equipped in mind and morals but like most college graduates, without a cent of capital other than their brains. They will probably go farther in the long run, but they will have to work harder.

We are inclined to favor the Japanese idea of colonization borrowed from Europe. To our mind, there is little gained by highly educating a backward people and then withholding the opportunities to put their knowledge into practice. It would seem much more sensible to improve their economic conditions and provide an outlet for their activities before elevating their social and political status. People enjoying economic prosperity are less prone to enter politics as a career, seeking their future in business rather than in government employment. Economic prosperity brings a desire for general education and develops in time that high type of citizen who takes an enlightened interest in government for the betterment of the public welfare.

Any country lacking a firm economic and industrial basis will breed politicians, job-hunters, grafters and other parasites who live at the expense of the people. This is what we have done to the Philippines.

We have carried our altruism into China, educating thousands of young Chinese in our colleges, turning them adrift with diplomas and degrees to return to a country where there is little opportunity to capitalize their knowledge. In effect, at least ninety per cent. of these returned students have either turned political agitators or

drifted into government jobs, where as the years roll on, experience tells us they become more hard-boiled in their outlook on public questions than any of the old type mandarins they displaced. We have expended millions to uplift the Chinese and better his moral, social and intellectual status: we have turned out hundreds of young Chinese engineers from our colleges, but not one cent have we contributed towards the material development of the country so our proteges can apply what they have been taught. In the same way that we have transformed a race of contented farmers in the Philippines into vociferous *politicos* shrieking for freedom, so we are storing up trouble in China by creating highly educated professional men whose only opportunity to apply their new learning, lies in political agitation or the holding of a soft government job. In the same way that it will bring no material gains to our commerce in the Philippines, so our policies here in China will bear little fruit in the keen trade competition with less philanthropic nations. The Chinese will buy in the cheapest market and where they can get the best terms.

A reaction to the exalted missionary fervor to spread American ideals throughout the world by encouraging backward peoples to shout for democracy, self-determination and national rights has set in. Sensible Americans are awakening to the truth that they alone cannot regenerate the world, and are concentrating their energies towards making their own country safe for democracy by combating the disintegrating influences which a misguided immigration policy has brought on our heads. American foreign policy is changing. The sway of the altruist, the dreamer and philanthropist which reached its climax under President Wilson, is giving place to a more practical outlook on world affairs.

Only a few years ago there existed a large element in America who fervently believed that it was the duty of the United States to " lick the daylight out of Japan " in order to protect 400,000,000 Chinese who would not fight for themselves. There are other Americans equally emphatic in urging the United States to free the Philippines and protect them against all future enemies and without any compensating advantages to their own country. This typifies the missionary spirit of American gone mad. It is refreshing to learn that one democratic senator has had the courage to voice common sense ideas in the following reply to Secretary Weeks, who asserted that America's duty to the islands had not been fulfilled, that the time had not arrived to sever relations :—

" For twenty-five years we have gone on giving what seemed to us many benefits to the Filipinos. Here is this group of gentlemen [the independence mission] who represent the more educated of them. They have seen their country develop with roads and schools ; they have seen disease reduced and mortality cut in half. They are the most educated of their people, and although they have seen all those things, they want us to get out and get out quickly. Why should we go ahead giving an unwanted generosity to them ? Why should we force our benefits down their throats, and why should we adjust our military policy as we do and pay out money for the defense of the Philippines as we do ? Why should we spend $12,000,000 a year for the protection of a group of people who do not want our protection ? Is it not time for us to be selfish ?"

To which Secretary Weeks replied : " If you are going to proceed from our own standpoint as a nation, for any benefit we get out of it, I would say, get out of the Philippines, because we do not want to make anything out of the Philippine islands."

Secretary Weeks evidently still holds to the old idea of America's mission in the world. " We do not want to make anything out of the Philippine Islands." But we are willing to squander millions taken from the pocket of the tax-payer for the uplift and protection of our wards for the pure joy of altruism, with no thought of possible trade returns or of preparing the Filipinos to take over the task of defending themselves. It stands to reason that somebody, sometime, is going to make something out of the Philippines, reaping where we have sowed. If we are to preserve intact the present laws which militate against the investment of foreign capital on a large scale and apply our Asiatic exclusion laws in an Asiatic country, the islands will never be developed and never reach that point where they can stand alone. In other words, under these conditions the time will never arrive when America can sever relations with the islands. Such a program is immoral, an insult to the intelligence of the American people and a millstone around the neck of the Filipinos.

The same spirit is demonstrated in our policy towards China, with the difference that here we do hope in time to make something, at least maintain equal opportunities with other nations to make that problematical something. Yea, we are willing to fight at the drop of the hat to preserve our footing in China and appropriate hundreds of millions for huge navies in the Pacific to assure that our rights in this direction are not impaired. Yet an analysis of the China trade situation will conclusively prove that our philanthropists subscribe for uplift work in this country twice as much as our traders take out in profits. We will not invest one dollar in China to expand our trade possibilities, yet we make huge appropriations to protect our interests here, which on further analysis says, we are interested solely in our right to continue to function as an eleemosynary institution.

If Secretary Weeks is right in saying that " we do not expect to make anything out of the Philippines " and we are right in our analysis that we do not expect to make anything out of China further than the right to pose as philanthropists, giving away millions of the tax-payers' money that is sorely needed to meet national expenses at home, then what in the name of all that is holy are we doing in the Far East ? We certainly do not require a huge Pacific fleet, Yangtze patrols, naval bases and other extravagant military equipment to continue in business as an eleemosynary institution. We can win our halo without the aid of such expensive persuaders. If our main mission is philanthropic, we may as well scrap the Pacific fleet and save the nation millions for upkeep that now flows out through other channels for uplift. Let down the bars in the Philippines so that capital and labor can create that firm economic foundation upon which a stable and efficient government can operate. Give the Filipinos bread to eat instead of pap and let them work out their own destiny. Work out a balance sheet of our trade with China and include those invisible exports of missionary and philanthropic gold added to the millions sent home each year by the Chinese residing in America and find out just where we stand. If we insist upon remaining in the philanthropic business, let us back up our uplift campaign with the millions that will create an economic basis in China so that our missionary endeavors will bring material returns in the future.

Americans have milled around in the Far East for the past two decades talking loudly about equal opportunity, the "open door" and the immense trade that awaits our manufacturers in China, while each year the capital investment in missionary, educational and uplift institutions keeps rolling up by its own momentum, yet not one dollar rolls its way into developments that will make possible the realization of our trade dreams and justify the enormous expenditures on armaments. It is time to be practical.

G. B. R.

Merit Rewarded

As a reward for his efficiency as acting manager of the Manila Railroad Company, Director of Public Works Jose Paez has been appointed general manager of the railroad. Director Paez took over the affairs of the railroad after the death of Colonel H. B. McCoy some months ago, at which time it was expected that a prominent railway executive would be called from the United States to take the vacant position. This was soon found to be unnecessary owing to the ability displayed by Mr. Paez in discharing his new duties, and his temporary position has now been made permanent.

* * *

The United States will have an embassy building worthy the name if plans forwarded to Washington by Ambassador Cyrus E. Woods are approved and the money made available by Congress. It is estimated that building and grounds will require an outlay of $1,000,000 and as additional land has been offered the Embassy in the shape of a lease of the estate of the late Prince Ito which adjoins the former embassy site, the grounds can be made commeasurate with the building. Ambassador Woods took the matter up with the State Department and the proper committees in Congress on his recent trip home and was assured that action would be taken during the present session of Congress.

* * *

According to Manila advices, the Philippine government is planning to dispose of its interest in the Cebu Portland Cement Company to a group of capitalists represented by Mr. C. F. Massey, president and general manager of the company. The price to be paid is said to be Pesos 2,600,000. It is understood that the sanction of the Board of Control, composed of Governor General Wood and the heads of the Senate and Assembly, has been given.

Japan's New Policy in Korea and Formosa

By Ralston Hayden in "Foreign Affairs"

BARON MAKOTO SAITO, governor-general of Korea, stated the fundamental principles of the colonial policy of the Japanese empire in three terse sentences: "The economic development of the country must come first. Education and the raising of the standards of the people will follow. Afterwards political development may be possible." He was discussing the problems of Korea, but his words describe perfectly the course which his country is following in every colony over which floats the banner of the rising sun. Prior to 1919 this policy was carried out by the application of naked force. In that year, however, the velvet glove of conciliation and "attraction" was slipped over the iron hand of Japanese control in Formosa and Korea, Japan's greatest colonies. The new methods by which these dependencies have since been ruled are being closely watched by the governments having large interests in the Far East. The United States in particular is interested in this newest phase of Japanese colonial policy not only because it has an important bearing on the general question of peace in the Orient, but because it offers some striking contrasts with the policy which America has followed in the Philippine Islands.

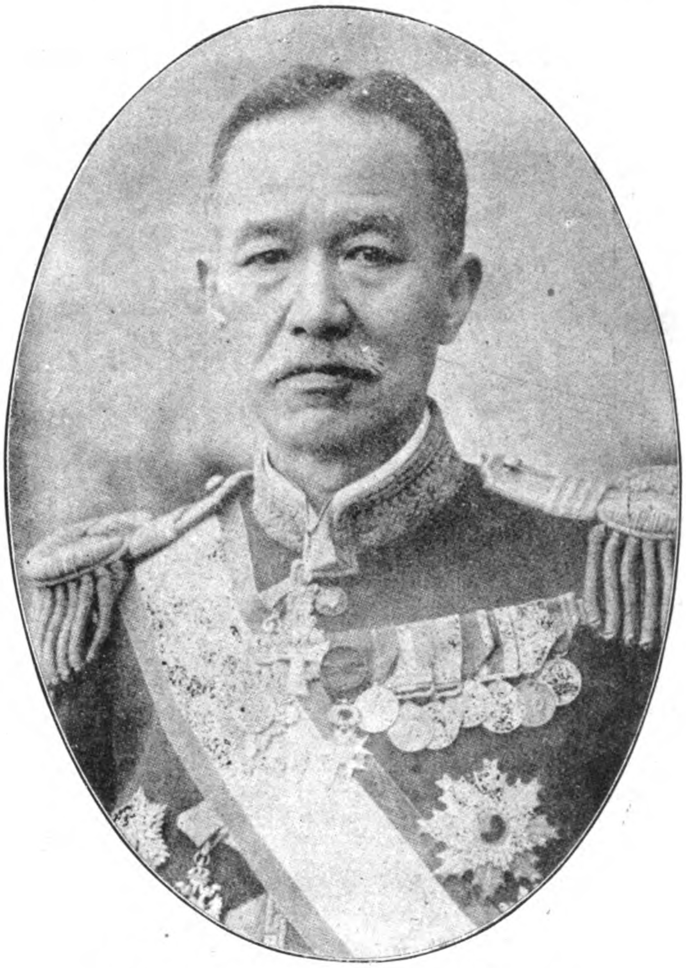
Japan acquired her first large colony, Formosa, in 1895 at the end of her victorious war with China. The population consists of about 3,500,000 Chinese, 80,000 Malay aborigines and 160,000 Japanese.

The traveler in Formosa is soon impressed with the truth of Baron Saito's statement that under the Japanese system the economic development of the country comes first. He sees splendid harbor works and port facilities, visits substantial and handsome public buildings that are far superior to those of most American states, and rides over a well built, excellently equipped and efficiently operated railroad system. He travels through two hundred miles of agricultural land that is as intensively cultivated as that of Belgium, and inspects enormous and growing industrial plants. Wherever he goes he observes all of the external evidences of prosperity.

If he turns to history and statistics the investigator discovers that this prosperity is genuine and that without question it is a result of Japanese rule. When the Japanese took over Formosa its annual imports and exports amounted to just a little more than 20 million yen; in 1921 they were worth more than 286 million. Until 1905 Japan annually subsidized the government of Formosa to the extent of millions of yen; for the past eighteen years the colony has made annual contributions to the imperial treasury. The Japanese have introduced scientific methods and abundant capital into industry, agriculture, fishing, mining, and forestry. They have created a modern transportation system. Above all, they have established a rule of law maintained by a reasonably honest and efficient government. Given these advantages, which it never had under the Chinese empire and apparently could not yet expect as a province of the republic, the Chinese population of Formosa has done the rest.

The remarkable economic development of their country under Japanese auspices has not, however, escaped the bitter criticism of the Formosan Chinese. Japan's policy, they believe, is simply

Baron M. Saito, Governor General of Chosen.



Baron K. Den, Governor, General of Taiwan.

JAPAN'S LIBERAL PRO-CONSULS WHO BROUGHT REFORMS TO CHOSEN AND TAIWAN

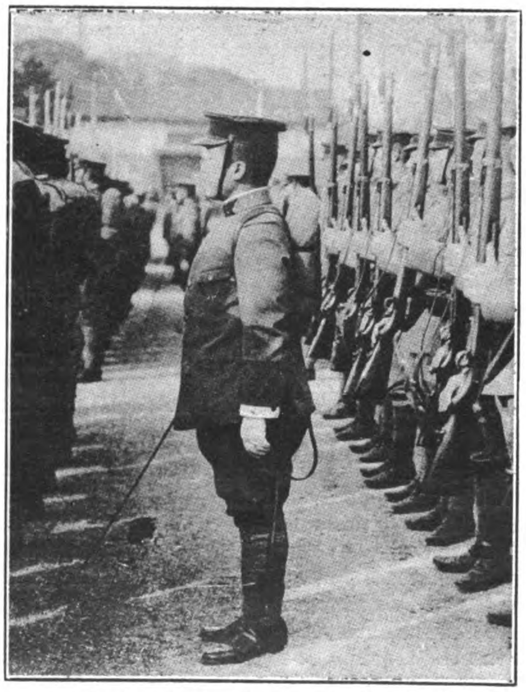
that of vicious exploitation. In the early days of the occupation they were robbed of the richest lands in the island by terror and chicanery. The Japanese government has monopolized the production and sale of camphor, tobacco, salt, opium, saké, and other spirits, the most profitable Formosan industries. The Formosans claim that their resources and labor are exploited by Japanese capitalists, and that the tariff laws give Japan a monopoly of the market and compel them to pay monopoly prices. In a word, it is their belief that the Japanese and a few rich Formosans whose political support they have purchased are the only ones who profit by the development of the country.

Investigation on the ground leads to the conviction that there is much truth in this indictment. On the other hand, there is no doubt that the lot of the common man is immeasurably better in Formosa now than it was before the Japanese occupation, or than it is in China. As for the higher class Formosans, they are beginning to participate more generally in Japanese enterprises in the island, and doubtless will obtain a larger share of the profits.

The visitor in Formosa also discovers the truth of Baron Saito's dictum that education and the raising of the standards of the people will follow economic development. He finds that Formosan cities are among the cleanest in the Orient, that they are well equipped to perform all of the manifold services expected of modern municipalities, and that they are efficiently managed. The same praise might well be given to the educational system and to the departments of sanitation and public health. In 1895 Formosa was justly considered to be one of the most unhealthy countries in the world. To-day no part of the Orient has more favorable health conditions, while a comparison of the Formosan health and medical services with those of the Philippines, for instance, is distinctly to the disadvantage of the latter.

His Excellency K. Uchida, the Newly Appointed Governor General of Taiwan, who Succeeds Baron Den.

" Afterwards political development may be possible," said Baron Saito. Is it it possible in Formosa while that island remains a part of the empire of Japan? The Japanese say that they hope so and that the colony is now entering this third and most delicate phase of its development. The Formosans are skeptical and point to the record of the past to justify their lack of faith in the future.



One Result of Japan's New Policy in Korea. The Korean Prince Riozeishi, Captain in the Japanese Army at the head of his Company.

For seven years after 1895 the Japanese army practically ruled Formosa. During this period the organized resistance of the Chinese population against their new sovereign was broken, banditry was stamped out, and the savage aborigines were brought under control. At the end of 1902, for the first time in its long history, law and order prevailed in the " Beautiful Isle." Life and property had become as safe there as in Japan. The reign of the soldier was followed by the rule of the policeman. When Viscount Kodama became governor-general in 1902 he gradually limited army activity to military affairs and exerted his authority over the people chiefly through the medium of a Japanese police force. Japanese as well as Chinese residents in Formosa declare that the policeman was a harsher and less considerate master than the soldier. Frequently he was of a distinctly lower type than the police in Japan proper. He held his Chinese wards in contempt, often spoke their language haltingly or not at all, and was apt to regard his short, blunt sword as the means best fitted for explaining and enforcing government ordinances. These ordinances regulated every aspect of life in Formosa. They were, and are, extremely galling to the Chinese population, for the Chinese are individualists who put personal liberty among the first of the desiderata of life.

Prior to 1920 scarcely a trace of self-government could be found in this oldest Japanese colony. The governmental organization was, and is, simple. At the head of the bureaucratic hierarchy stand the governor-general and the director-general of civil administration. They administer the government through the bureaus of the government-general, the governors of the seven provinces, and the chiefs of the fifty districts into which the island is divided. All of these officials are members of the Japanese civil service, an organization which exhibits the usual virtues and defects of highly trained bureaucracies. This hierarchy is paralleled by a series of police officers, directed by a bureau of police in the central government. Within the towns and villages the people are divided into small groups, for each of which a native headman is made responsible.

In 1919 the imperial cabinet took the initial steps towards the liberalization of this autocratic system of government. Baron Kenjiro Den, a distinguished liberal statesman, became the first civilian governor-general of Formosa, and a series of important reforms was undertaken. With the chief executive officer of each of the political divisions of the island was associated an advisory council. These councils are appointed and are composed of Japanese officials, private Japanese residents of Formosa and Formosan Chinese. Their functions are advisory only and obviously they are completely under the control of the government. Nevertheless they do afford an official channel for the expression of popular opinion ; they may be able to influence, even though they cannot possibly control, official action. In Formosa great differences of opinion exist as to their value. There seems to be a general feeling, however, that the local councils are giving the people some voice in the administration of local affairs.

Coincidently with this extension of political privileges the government adopted the policy of offering to Chinese Formosans educational opportunities equal to those afforded Japanese residents. From their first days on the island the Japanese had furnished primary schools for Chinese as well as for Japanese children. Instruction, however, was in the Chinese language, the schools often were inferior in quality, and it was only in exceptional cases that Chinese children actually passed into the higher institutions, in which Japanese alone was spoken. " This is manifestly unjust," said Baron Den. " It is eminently proper that we also grant them opportunities of education not inferior to those available to our own children ; that we encourage them to develop ; that we foster men of genius in all walks of life, thereby increasing the resources of our country. And it is with this in view that I have made it possible for Formosans *qualified in the Japanese language* to enter schools for Japanese children. Excellent results have already been obtained, with incalculably good effect upon *our policy of assimilation*." (The italics are the writer's.) As a further measure of assimilation with Japan the imperial civil and commercial codes have recently been extended to Formosa. Although the displacement of the old Chinese law may cause some temporary confusion and hardship, yet it will give Chinese Formosans many rights which they have not hitherto possessed, and will put them on a legal equality with the resident Japanese.

The professed goal of the recent reforms in the administration of the island is the "Formosanization" of the government and, perhaps, its ultimate assimilation with that of Japan. The writer believes that this is the real purpose of the Japanese. Whether they will have the political sagacity and the courage to accomplish it, —whether, indeed, it is possible of accomplishment,—is another matter. Twenty-seven years of despotism is not a very sure foundation upon which to build liberal institutions. A large number, probably a majority, of the politically active Formosans will not even admit the sincerity of the government's intentions. A mass meeting of Formosans residing in Tokyo recently adopted and distributed resolutions criticising Baron Den's administration bitterly. A paragraph from this manifesto, translated into English by a Japanese, sets forth some of the political grievances of the nationalists and reveals their general attitude towards the "sham reforms":

"According to the present system of government in Taiwan, the powers of making laws, judicial and other acts of administration are vested in the governor-general. It is really a despotic government. The governor-general does not understand the real will of the Formosans, who have special life and customs. He does nothing but hoodwink the people by establishing false self-government, by allowing Formosans into Japanese schools,—not actually carried out,—and by promulgating dead laws allowing Formosans to become higher officials. As an instance of maladministration we point out the rigorous laws governing the punishment of rioters, unlawful disposition of loafers, compulsory labor, intervention in sugar cultivation and its sale, requisitioning of money and land, etc. Thus the government infringes upon the rights of the people and they are able to do anything they want. The almighty government! . . . The lawful organization of the political society claiming legislature in Taiwan was prohibited, to the great disappointment of Formosans who rely upon the Japanese empire. The magazine *Taiwan* was prohibited distribution, as it contained articles by noted men of Japan on the claim of Formosa for a separate legislature. 3,600,000 Formosans have no recourse for redress, enduring oppression and humiliation. Such an attitude of the government only tends to provoke the ill-feeling of the ruled, and is not the one to be taken by wise administrators who wish ultimate success in the administration of the island."

This manifesto could not have been issued in Formosa. The expression of public opinion there is made practically impossible by the government. But Formosans in Japan, Manila, and the China coast cities tell whom they can that their people will never cease to resist assimilation, and that China will not rest satisfied until the Japanese are expelled from this old Chinese province. Occasional flashes in Formosa itself reveal the forces of discontent that are normally concealed by the Japanese machinery of repression. A number of strikes of a revolutionary nature have occurred in the upper schools; upon the occasion of the visit of the prince regent last April 532 prisoners who were in jail for revolutionary activities were given commutation in their terms of imprisonment. A highly intelligent Japanese gentleman told the writer in Formosa that, "It is now a race between liberalization and revolution."

More than a quarter of a century of despotic Japanese rule in Formosa, then, has produced the following results: law and order, economic prosperity, elevated standards of living, widespread education, and rising political discontent. The writer believes the Japanese government realizes that if it cannot solve the political problem with which it is now faced, its remarkable material achievements in Formosa will, in the end, avail the empire nothing.

In Korea the Japanese have applied the general policy and many of the methods which they first developed in Formosa. The economic results bid fair to be equally satisfactory, although the problem is both greater and more complex. No one who has not seen with his own eyes what the Japanese have done in Korea can appreciate their truly remarkable accomplishments. Railroads, steamship lines, hotels, banks, mines, afforested mountain sides, scientific agricultural projects, schools, hospitals, and cities of stone, brick and cement are the visible products of the marvelous mechanism of colonization which Japan has built up during the past generation. No country has ever created such a complete, well organized, abundantly capitalized and ably directed organization for the economic penetration and conquest of other lands.

Thus far the masses of the Korean population have appreciated the ministrations of their foreign rulers about as heartily as our early activities in the West were relished by the Crees and the Sioux. Yet they are on the ground, 17,500,000 of them. They possess a national history, national institutions, and a national consciousness that are more ancient than those of Japan herself. If they are lazy and decadent they are also proud and stubborn. Unlike the American redskins they cannot be brushed aside, driven out, nor exterminated.

The Korean rebellion of 1919 revealed to the world that Japan's astonishing material achievements in this colony had been accompanied by a tragic failure to solve satisfactorily the problem of the government of the Korean people. Nor was the lesson lost upon the Japanese themselves. No sooner had the rebellion been crushed than vigorous steps were taken to reorganize the government of Korea and to infuse a new spirit into its administration. An imperial rescript announced that the objects of the reforms were "to treat both Japanese and Koreans as equals, and to enable the people of Chosen to live in peace and prosperity by endowing them with an administration conducted on a liberal and cultural line." The new governor-general issued a proclamation frankly admitting the necessity of reforms and outlining the policy which he expected to follow. "I am determined," he declared, "to superintend officials under my control and encourage them to put forth greater efforts to act in a fairer and juster way, and promote the facilities of the people and the unhindered attainment of the people's desires by dispensing with all formality. Full consideration will be given to the appointment of Koreans so as to secure the right men for the right places, and what in Korean customs and old institutions is worthy of adoption will be adopted as a means of government. I also hope to introduce reforms in the different branches of administrative activity, and enforce local self-government at the proper opportunity and thereby insure stability for the people and enhance their general well-being. Sedition, however, was not to be winked at, and the proclamation ended with this sentence: "If anybody is found guilty of unwarrantably refractory language or action, of misleading the popular mind, or of impending the maintenance of public peace, he will be met with relentless justice." In effect, the Japanese announced a new deal in Korea; but served notice that they would still make and enforce the rules of the game.

A large volume would be required to describe all the reforms which have been inaugurated in Korea since 1919. A few of the more important ones may be mentioned, however, with the remark that they constitute an official confession of the previous existence of conditions in Korea against which even the most docile of people might have been expected to revolt.

1. The government has abolished legal discrimination between Koreans and Japanese in the Korean civil service with reference to salaries, pensions and promotions, court rank, and decorations. The regulations limiting the jurisdiction of Korean judicial officials to cases in which both parties were Koreans have been rescinded. Punishment by flogging, which had been applicable only to Koreans, has been abolished. A general amnesty has been granted to Koreans implicated in the rebellion of 1919.

2. Formalism and red tape in the conduct of the government have been greatly reduced. Civil officials, save in exceptional cases, no longer wear uniforms. There has been a considerable decentralization all through the government, especially as between the central and the local administrations.

3. Means have been provided for the expression of Korean opinion. Leading men from all of the provinces are called to Seoul periodically for an exchange of views regarding the administration of the country. Inspectors, both Korean and Japanese, are continually in the field, "for the inspection of local conditions as well as for the observation of popular ideas and desires." The publication of a few newspapers printed in Korean is permitted. The central council, long intended to serve the governor-general as an advisory organ, has been reorganized and is more frequently consulted.

4. The educational system has been reorganized in such a way as to meet, in part, the wishes of the Koreans.

5. The local administrative system has been reorganized. Partially elective, partially appointive advisory councils have been created in the several areas of local government. A portion of the Confucian temple funds which had been diverted to other purposes (stolen, the Koreans aver) has been returned to its former uses. The requisition of labor and the forced donation of land for the construction of highways has been greatly reduced.

6. The police system has been reorganized. Prior to 1919 the police and the gendarmerie were united under one command and were directed from the central government. The two services have been separated, the former has been reduced in size, and

the direction of the latter transferred from the central to the provincial governments.

7. Definite steps have been taken to guarantee an increased respect for Korean usages and customs.

In addition to instituting these specific reforms the Japanese have attempted to win the confidence and the co-operation of their Korean subjects by many other means. Influential Koreans are taken to Japan and there entertained with the charming hospitality of which the Japanese are masters. A moving picture film service has been used extensively to familiarize Koreans with Japanese life, and vice versâ. A special propaganda office has been established to acquaint the people of Korea, Japan and elsewhere with the new governmental policy. Representative Korean officials, teachers and scientific men are frequently sent to Japan to attend conferences of leaders in their special fields. Social intercourse between the two races is encouraged at every opportunity. Vigorous efforts are being made to educate the rising generation in the Japanese language. No opportunity to emphasize the racial and cultural affinity of the Koreans and the Japanese is overlooked, and their common citizenship in the empire is constantly harped upon.

Obviously it is difficult for an outsider to gauge either the sincerity or the probable results of such a reform program. Indeed, even the opinions of Koreans and of Japanese and foreigners long resident in Korea differ on these questions. The writer felt at the time, and still feels, that the governor-general, Baron Saito, spoke very frankly about the purposes of his government and the difficulties with which he is confronted. After declaring that economic development *must* come first, that education and elevated standards of living *would* follow, and that afterwards political development *might* be possible, he went on to say that there were many difficulties to be overcome. " The chief of these arise from the character of the Koreans. Many of them are crooked. They want "squeeze " from the Japanese and their own people. They are lazy. At present Bolshevist agents and money are stirring them up. The Russians, though, are clever. They do not give them too much money at once. Of course there are many Koreans who wish to co-operate with us for their country's welfare. But we cannot ask too much of these men. They are in danger from their own people. The Japanese desire to have the Koreans contented and happy. We don't want to make Japanese out of them against their will. But for our own safety, we must govern this country. We hope that in time the Koreans will realize that they need our assistance. They can do nothing by themselves." These plain words from the man who is the chief instrument of Japanese rule in Korea are refreshingly at variance with the familiar propaganda about peace, harmony and brotherhood in a land where these blessings have not existed for many years.

Like Rome at its best, Japan sends first-rate statesmen to be her proconsuls, gives them free rein while in their provinces, and holds them to account for results. No colonial minister or department in Tokyo stands between the Japanese governor and the imperial cabinet. The colonial bureau is merely a secretariat attached directly to the office of the premier. Its chief is not an important or powerful official, and its functions are merely the transmittal and filing of colonial papers. Japan's colonial governors are immediately responsible to the premier alone.

Among foreigners resident in Korea there is much more respect for the present administration than a visitor at first supposes. For the brutalities and stupidities of the past there is little but reprobation. But those Europeans who themselves have to deal with Koreans seem inclined to talk about the difficulties with which the government is faced as well as about its shortcomings. One foreigner whose opinion regarding Korea would be respected anywhere spoke substantially as follows : " One of the greatest difficulties faced by the Japanese is in securing the co-operation of the Koreans. Of course a large proportion of the population is determined never to co-operate. But there is, and always has been, an important Japanese party among the Korean people. This party is growing rapidly. Its members have made up their minds to accept Japanese rule as inevitable and to make the most of whatever advantages are offered by it. Yet they seem to be unable to get together among themselves or with the government on any practical proposition. The masses are indifferent, or at least quiescent. The 'intellectuals,' who have not much to lose, are the principal agitators. The trouble with them is that they do not tie up to any principle. They reach for and seize this panacea and that. Their minds are in a ferment but produce nothing. They don't know what they want, but they want it like the devil."

This same foreigner had recently returned from a trip which had taken him into every corner of the peninsula. " I found," he said, " that the Japanese are just as active in public health enterprises, educational work and other activities in remote districts as they are along the trunk line railway. I visited schools everywhere and found them crowded to capacity. Out of 300 or 400 pupils only twenty or thirty would be Japanese children. The rest were Koreans. The teachers were both Korean and Japanese. A few years ago—before 1919—the people were indifferent or hostile to the schools. Now they are eager to have their children attend, and the problem is to take care of them all. In recent years the knife has been used pretty freely on the Korean budget (made in Japan), but the school appropriations have not been touched. In fact, last year when there was a million and a half yen cut in the personnel of the government that amount was added to the educational budget."

Many other resident foreigners relate incidents in their experience with the Koreans and express opinions concerning these people that tally closely with those of the gentleman just quoted. One of the most distinguished of them in discussing the attitude of the Koreans toward the Japanese said : " In 1919 the country was aflame with hatred of the Japanese, a hatred that can be well understood. Many of the causes of that bitterness have been removed. The older people still cherish it fiercely ; many Koreans try to keep it alive as a matter of pride, or of habit, or almost of religion. Yet time is working against them. Education and modern civilization are working against them. Thousands of Koreans who as a matter of course tell you that they hate the Japanese, get along perfectly well with the individual Japanese people with whom they come into daily contact. I should not care to predict how it will end, but we all know that if the Japanese were to withdraw to-day there would be chaos to-morrow."

For obvious reasons it is much easier to get the story of the Korean nationalists in many other parts of the Orient than in Korea. In Manchuria and Siberia reside more than 2,000,000 emigrants from the former Hermit Kingdom. Small groups of them are to be found in many of the cities along the China coast and in Japan itself. The Japanese propaganda agents very naively say that the Manchurian-Siberian group, most of whom are agriculturalists, emigrated " on account of the difficulty of living caused by the extraordinary rise in the prices of commodities in recent days ; as a matter of fact, some 45,000 Koreans migrated from Chosen to Manchuria *during* 1919, mostly from this cause." (The italics are the writer's.) The plain fact is that most of these people abandoned their homes and fled from their native country rather than endure Japanese rule ; or, in many cases, because the Japanese robbed them of the land upon which they had lived. A majority of the leaders of the Korean party of violence are members of this group. They hope to overthrow the Japanese régime by assassination, rebellion and attacks over the northern border, and they make frequent attempts to oust their foes by these means.

One centre of Korean nationalism is in Shanghai. The " Provisional Government of the Republic of Korea," which was set up there in 1919, and which sent emissaries to the peace conference at Versailles, has now disintegrated. It has been replaced, however, by a " Korean Congress " composed of about 150 members representing the irreconcilables of Korea, Manchuria, and Siberia, as well as exiles living in Hawaii and the United States. One of these irreconcilables gave the writer an account of the character and the activities of the " Congress " which tended to confirm much already learnt in Korea itself. " We have been sitting now for several months," he said. " There are two main parties. One of them wishes to use violence of every sort against the Japanese. The other, representing the American Koreans and other groups outside of Manchuria and Siberia, feel that we cannot cope with Japan's military power and must rely upon moderate methods and a constant appeal to world opinion. So far no agreement has been reached by these two factions. Feeling between them has been bitter at times. Our difficulties are increased by the constant presence of spies. Whatever we say, the Japanese know all about it the next day. If a dozen of us meet secretly each one wonders who is the traitor. Of course we have our organization in Korea. But Japan still rules there by terror and our men are constantly being taken. Only to-day I learned that one of our friends who had been collecting

data upon the extent to which the Koreans have been dispossessed of their lands, was arrested as he was attempting to get out of the country. But we have ways of keeping in couch with our people at home. If one man is caught another gets through."

This Korean is confident that the new Japanese policy of "attraction" will fail to win his people just as the former application of undisguised force failed to subdue them. "We have no fear for the long future," he said. "The Korean people will never give in. The Czechs held out for several centuries. Now they are free. We can do that, and more. The Japanese are always doing stupid things to keep the hatred of our people alive. They will have to take all of our land and drive us all out of the country before Korea will be safe for them. This they cannot do."

The more intelligent of the Korean irreconcilables pin their hopes for the future upon China and Russia. They regard Japanese supremacy in the Orient as a passing phase, a mere incident in the great drama of history. In common with many Chinese they hold their overlords in contempt as well as hatred. Inevitably China will come into her own. When she does the barbarians will be broke utterly. This is what one hears from Mukden at Batavia. As for Russia, her day is coming too, they say. She does not forget.

An American who returns to the Philippines after a sojourn in either Formosa or Korea would be less than human if he did not feel a certain sense of pride in the larger spirit of liberty which is characteristic of our Oriental dependency. Yet those who understand the situation in the Philippines recognize that in one important phase of colonial development the United States has been far less successful than has Japan; and they realize that both Americans and Filipinos, especially the latter, will have to pay the price of that comparative failure.

During the American régime in the Philippines political and general education has enjoyed an unparalleled growth. Yet during this period Americans and Filipinos have not succeeded in laying an economic foundation substantial enough to support the social and political superstructure which they have erected. The result is that not only independence but further progress of any sort in the islands must wait upon the creation of a vastly greater national income than will be available for some years to come. The Japanese, on the other hand, have proceeded much more slowly in the social and especially the political development of Formosa and Korea. Once they are seriously embarked upon a progressive program, however, both of these countries will have at their disposal ample means for the completion of their task. At the present time the annual income of the government of Formosa (population 3,500,000) is about $50,000,000; while the government of the Philippines (population 11,500,000) has at its disposal about $32,000,000 yearly. Considering the cost of the modern civilization which both of these people covet these figures are of great significance.

Where are the Japanese coming out with Korea and Formosa? Will their present policy of "attraction" and the great material advantages which they have given these colonies so dim the memories of the past as to produce at least an acquiescence in Japanese rule? Or, in some future struggle, will one of these dependencies prove to be the Achilles heel of the island empire? Press reports of a bloody uprising of Koreans in Tokyo and Yokohama during the recent disaster suggest vividly the dangerous possibilities of a permanently hostile population in Formosa and Korea. In the developments of the past four years there is much evidence that Japan realizes the danger of the situation and that she is determined to consolidate her military gains by political and moral victories. It is to this ned that the new Japanese policy in Formosa and Korea is directed.

1924 Plans for Machinery Exports

Extracts from a Recent Report by W. H. Rastall, Chief Industrial Machinery Division, U. S. Department of Commerce

The Sales Manager's Problem

IN developing plans for their sales campaigns of 1924 machinery manufacturers of the United States may find it necessary to completely revise their estimates of the relative value of various foreign markets. Frequently in conversation manufacturers indicate that they feel that their entire export interest lies in Europe, although statistics show that about 80 per cent. of the machinery exported from the United States now goes to non-European countries. It should also be emphasized that during the last decade these non-European markets have become much more important to the American machinery-export trade. Furthermore, since the armistice business and political conditions in Europe have been such as to restrict our machinery exports thither in a serious way.

Latin America is now absorbing a much larger volume of American machinery than was the case in pre-war years, but the greatest expansion of all has been in trade with Asia. In 1922 the value of our machinery exports to Asia, while very much less than in the three preceding years, was still seven times as great as in 1910, or 1913, or 1915. The time has come when machinery manufacturers should carefully reconsider the extent to which they are justified in expending sales effort in non-European markets and particularly the Far East.

Source and Nature of Competition

In the machinery markets of the world American manufacturers have found their most important competition to be from European sources. In pre-war years Germany furnished perhaps 45 per cent. of the machinery that entered into international trade. As a result of the war and of recent events the nature of this competition is changing very rapidly. During the war this German trade was negligible, but following the armistice manufacturers there made an earnest effort to regain or improve upon their former export position, and the daily press and trade papers have been publishing a large number of reports with regard to the post-war influence of Germany in the world machinery trade.

For a time the German manufacturers enjoyed certain advantages, particularly in connection with the falling mark, but during 1923 these conditions changed radically, and reports now received from practically all foreign countries indicate that, temporarily at least, German competition has lost its force. Speaking generally, German prices are now above world-market levels, and the exchange advantage of the mark has been lost. It would appear that the business formerly secured by German manufacturers is now open to producers in other countries, and American manufacturers should make plans to secure as much of this business as possible and during 1924 give particular attention to those markets that formerly depended largely upon Germany for engineering supplies.

To a certain extent France is benefiting from the above situation. Under the Treaty of Versailles and other international agreements France has greatly increased its productive capacity for iron and steel and manufactures thereof, and to a degree French competition in the international machinery trade has strengthened. Reports received from Italy and Spain indicate that French machine-tool makers are exerting a much stronger influence in those markets than was the case before. France also is now deriving certain commercial advantages because of the decreasing exchange value of the franc and, in a measure, is repeating the experience of Germany during recent years. French prices for machinery, bridges, etc., have been found very low when compared with those for similar products from other countries. It is not possible at this time to indicate the extent to which this situation will influence the nature of the machinery French manufacturers will offer in the world's markets or the length of time that they will enjoy a peculiar advantage because of currency depreciation.

Great Britain the Strongest Competitor at Present

Because of the conditions outlined above the world machinery trade is now largely in the hands of Great Britain and the United States, although a small amount of such business is done by Sweden, Belgium, Switzerland, Italy, and Japan. It would appear that for the immediate future American manufacturers will find their strongest competition from Great Britain, and for this reason particular interest attaches to reports received showing that British manufacturers are bringing out new designs, many of which follow the same general lines used by American manufacturers for years.

Labor has now become comparatively expensive in the United Kingdom, and shop equipment has been improved in an effort to reduce labor costs. In these respects British conditions are beginning to resemble those that have obtained in the United States for a long time. As a result that United Kingdom is more and more a market for the highest grade of machinery and the most refined types of labor-saving equipment, while gradually in the other markets of the world British designs are approaching those offered by Americans.

In general, European machinery is lower in price than American machinery, largely because of difference in design. As a consequence those buyers in foreign countries who consider only price will almost invariably purchase European equipment. This makes it necessary for the American manufacturer to put forth sufficient sales effort in the non-European markets to demonstrate to his customers the superior quality of his goods, and during 1924 he should arrange for educational campaigns to show potential foreign buyers why high-quality, high-priced equipment from the United States should be selected instead of cheaper but less refined designs from other sources.

Leading Markets Analyzed

Possibly it should be repeated that sales effort will ordinarily show the best returns in markets that are expanding, and it is seldom desirable to expend much work of this character in markets that are contracting. Even this rule is unsatisfactory, however, for there are countries in which exceptional conditions exist. China, for example, will probably not be found a satisfactory territory for unusual sales effort.

Applying the principle in a general way, however, during the current year manufacturers should give particular thought to the possibilities of expanding their business in Japan, India, the Dutch East Indies, and other Far Eastern fields. Also, in analyzing problems and developing sales programs for the current year, most of the news reports that are presented so sensationally in the press should be disregarded, as these frequently represent exaggerations.

Japan

In 1922 Japan ranked second among the markets for American industrial machinery, taking $14,256,017 worth; in 1921 it was fourth, in 1919 fourth, in 1913 eighth, and in 1910 tenth, absorbing in the last-named year $1,741,402 worth. Obviously, the Japanese market has been expanding rapidly, increasing not only in volume but in relative importance. Also, the American position there has been improving, the share of the country's business secured by United States manufacturers now being much larger than was the case in former years. American machinery is well known in Japan and enjoys an excellent reputation.

Heretofore the exchange situation also has been satisfactory. In 1923 (December excluded) the yen reached a high of 49.02 and a low of 48.03, showing an extreme fluctuation of only 2 per cent., and therefore not proving any serious obstacle to the conduct of business. Unfortunately, since the turn of the year and from causes largely growing out of the earthquake disaster, exchange fluctuations have been much more extreme and rapid, the yen having recently fallen to less than 44 cents.

Character of Demand by Earthquake

As a result of the earthquake there is a demand in Japan for a large volume of new construction, and it is to be anticipated that new methods will be employed in the rebuilding, creating a demand for mechanical equipment of many kinds. Until recently many of the industrial operations there employed methods that involved the use of a disproportionate amount of labor; but conditions are changing very rapidly. Since the earthquake, and for the first time, motor trucks have been employed in large numbers for highway transportation. Other important changes are to be anticipated, but no one can say exactly what modifications will be adopted.

It would appear that machinery manufacturers of the United States should give careful attention to developments in Japan in order to take advantage of the situation and arrange for the introduction of their products. Japanese labor is no longer cheap, and there is every reason to expect the larger employment of labor-saving devices from this time forward. Tokyo and Yokohama will be rebuilt; their main thoroughfares will doubtless be straight, wide, and supplied with all the facilities known in the Occident; the buildings will be constructed along improved lines and in many instances of fire-resisting, if not fireproof, material.

But entirely apart from the influence of the earthquake the 1924 machinery trade of Japan will be important, for, it should be remembered, many of the country's chief factories were not within the affected area and there will be the usual demand for plant equipment by Japan's industries—industries that have shown remarkable development during the past two decades.

China

In 1922 China ranked fifth, absorbing $8,251,768 worth of American industrial machinery; in 1921 it also was fifth, but the value was $18,184,978. In 1919 it was seventh, in 1913 twenty-eighth, and in 1910 fifteenth, taking in the last-named year $641,732 worth. It will be noted that the demand for mechanical equipment in China has expanded rapidly. American participation in the machinery trade of China also has increased, and a large volume of very attractive business has been secured from that area during recent years.

In connection with exchange it should be remembered that China is to a large extent on a silver basis. In the first 11 months of 1923 the high quotation for the Shanghai tael was 76.54 and the low 69.25, representing a fluctuation of about 9½ per cent., which is not abnormal for a silver country. If reference be made to the Mexican dollar in China, the exchange fluctuation was much narrower, being less than 3 per cent. All of these rates are above what might be considered par on the basis of pre-war averages, so that, so far as exchange is cencerned, the situation in China is not unsatisfactory, although the rates are much lower than was the case shortly after the armistice.

Good Salesmanship Needed

Although the foregoing indicates that China is rather attractive as a market for American machinery, other information indicates that, in general, it is not so good a field for extensive sales effort. Final statistics are not yet available, but reports received suggest that this trade contracted sharply in 1923, and the end of the year found the market there dull with no outstanding features. The outlook for 1924 in the machinery trade of China is not especially encouraging.

Textile machinery forms a large part of the machinery trade there, accounting for a much greater share of the business than will be found in most countries. During recent months China's imports of cotton-spinning machinery have diminished markedly. This is an item of great importance, as China has of late absorbed a large volume of American textile machinery in addition to heavy purchases from British sources.

Although these facts would seemingly discourage sales effort in the China market, it should also be remembered that British participation in the machinery trade there has been increasing rather rapidly, making it necessary for American manufacturers to employ a high degree of salesmanship if they are to maintain their position in the market. China appears to be starting an important movement toward industrialization, so that sales effort, if expended at this time, will have greater effect on future business in that territory than a larger effort would have some years hereafter.

British India

India ranked seventh among buyers of American industrial machinery in 1922, absorbing $5,390,227 worth of our equipment. In 1921 it ranked eighth, with $10,772,891; in 1919 fifteenth, with $4,822,136; in 1913 twenty-second, with $628,063; and in 1910 nineteenth, with $516,438. It would be difficult to find a market which has shown a more important expansion.

On the score of exchange, the high for the first 11 months of 1923 was 33.2 and the low 30.3, a fluctuation of less than 9 per cent., which should be considered peculiarly satisfactory because the exchange fluctuations in India in the period between 1918 and 1922 were very wide, rapid, and serious. A further factor of great interest is that India regularly has a heavy excess of exports to the United States, occupying in this respect a position that is the reverse of most of the European countries. This "favorable" balance should make it possible at all times for India to pay for machinery imports without difficulty.

India is definitely committed to a policy of industrialization and, it is anticipated, for an important number of years will be a steady purchaser of industrial machinery of many kinds. This is the sort of market where sales effort can be expended to good advantage. It is not possible to state in a few words the nature of the demand that will develop, but as India is a country about three-quarters the size of the United States, with three times the population, it will obviously have use for a very great variety of mechanical equipment. It is a market in which American participation is now relatively small, principally because the field has not been cultivated by American manufacturers. Like China, it is a territory where textile machinery has been imported in large volume, but American hydro-electric equipment, steel-plant equipment, railway equipment, machine tools, construction machinery, and many other lines are being used in India with excellent results.

Philippine Islands

The Philippine Islands ranked twelfth among purchasers of industrial machinery from the United States in 1922, absorbing $1,632,404 worth. In 1921 the islands ranked eleventh, in 1919 eighth, in 1913 eleventh, and in 1910 eighteenth.

The currency of the Philippine Islands is based on the United States dollar, and exchange fluctuations are usually very narrow. For the first 11 months of 1923 the total spread was less than 3 per cent. Such slight variations do not interfere with commerce in any serious degree.

Business in the Philippines has been difficult during recent years. In 1919 American machinery was imported there in excess of $10,000,000; in 1921 the value had dropped to $5,529,555, and for 1922 the total was but $1,632,404, as previously stated. Numerous influences have contributed to this result. The collapse of the sugar market that had such a strong influence in Cuba and Java and other sugar-producing countries about 1920 was felt in the Philippines also. Similar embarrassment was experienced in connection with the coconut-oil industry; important volumes of machinery for this industry were imported a few years ago, for which there is no longer a serious demand. In other ways the business situation has been difficult; but just as conditions have improved in Cuba, so is a similar but possibly less marked improvement to be anticipated in the Philippines.

Netherlands

With regard to the situation in the Dutch East Indies, it should be noted that this archipelago is one of the most important producers of sugar and rubber, and the recent improvement in world trade in these and other island products is having a beneficial effect on business there. There is reason to believe that the sugar machinery in Java has accumulated a great deal of deferred maintenance; the railways are in need of equipment, as are also the mining properties and the petroleum industry; public improvements have been delayed and will require construction machinery; along many other lines the archipelago is in need of mechanical equipment. These orders will be controlled to a considerable extent by persons inthe Netherlands. Furthermore, this is a market in which Germany previously exercised great influence, and it would appear that the present is a time when American effort can be made there to advantage. Plans should be laid to give these two markets very careful attention during the current year.

Conclusion

The year 1920 was the best year in the American machinery-export trade, with a total value in excess of $324,000,000. Since that time there has been a decline, the total for 1922 being but $112,000,000. Indications are, though, that the low point of the present depression has been passed, and from this time forward we may expect our machinery exports to increase in volume.

* * *

Worth a Trial

Withhold the Customs and Salt Surplus from Peking and Force a Conference

OVER a year ago we sat in a camp chair at Dr. Sun Yet-sen's headquarters on the outskirts of Canton and listened while he expounded his ideas for bringing about peace and unification to his country. Dr. Sun then saw what everybody is now beginning to accept as the only practical solution to China's difficulties. To his mind the first step towards reorganization of finances, funding of the public debt, disabandment of troops, construction of railways and development of trade and industry was a unified central government representative of all the provinces. Unification could be brought about, he said, only by calling a conference in which all the warring factions could meet and agree on some compromise that would result in united support to some scheme of representative government. If such a conference could not be held; if the militarists persisted in wrecking the country in pursuit of their own selfish ends, there was a way to bring them to their senses.

Dr. Sun adhered firmly to the belief that the power of the militarists would be broken when their main source of revenue was dried up. He declared that they were enabled to preserve their hold on the country solely because the foreign powers continued to recognize their puppets in Peking and to pay over to these collection agents the surplus customs and salt revenues, which, in turn, maintained their armies. If the powers declined to further pay these sums to Peking it would result in a speedy desire for unification. He further said that the powers could employ this surplus to pay off the unsecured foreign debt and any remaining surplus could be held in trust for a unified Chinese government.

Over a year has passed since Dr. Sun publicly expressed these views. It was largely to invite attention to this plan that he threatened to seize the Canton customs last November. While he may have been unsuccessful in precipitating intervention over this incident there is increasing evidence that his ideas are taking root and are now being advocated in quarters which in the past have been bitterly critical of Dr. Sun and his policies. Dr. Sun's threat to seize the Canton customs undoubtedly influenced the chairman of the Hongkong & Shanghai Banking Corporation to declare at the last annual meeting of shareholders that "any measure which by recognizing the claims of seceding provinces to a division of the customs revenue after international obligations secured upon it have been satisfied, would be a retrograde step in the direction of further disunion. As long as the Peking government continues to be recognized by the Treaty Powers as *de facto* government of the country, it must be entitled to receive the whole customs revenue. But, if its claim to do so is challenged by provincial secessionists and pressd by them to a point endangering the present administration of the customs service as defined by international agreements and the prescriptive agreements of sixty years, then the remedy would appear to lie in withholding the customs surplus from all the contestants to accumulate in reserve until they had composed their differences and military operations in all parts of the country had ceased. Such a step would, he believed, have the approval of all who sincerely desire to see the end of the civil strife now disrupting and ruining a great country which, with no external enemies but almost limitless potential resources, would be one of the most prosperous countries in the world."

This recommendation received the endorsement of the *North-China Daily News*, who said that "it was the only efficacious way of dealing alike with this question and that of the projected surtax." *The China Press* on April 17, also swung into line and accepted the program outlined by Dr. Sun and the chairman of the Hongkong and

(*Continued on page 215*).

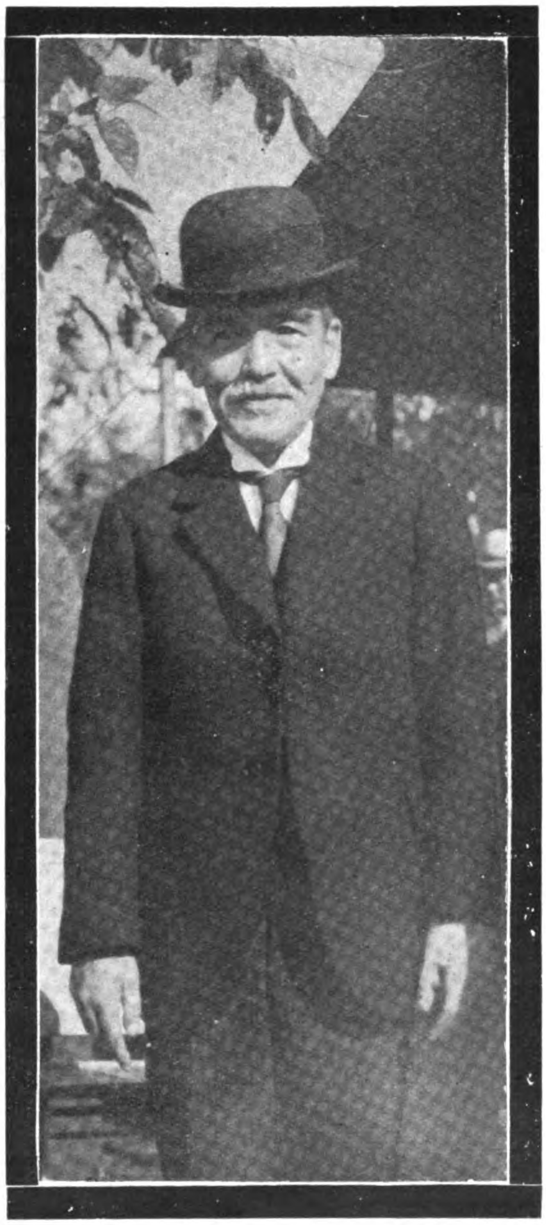
Baron Hikokichi Ijuin

A Tribute to a Great Work Well Done

FEW indeed are the men in Japan who understand China and America as did Baron Hikokichi Ijuin, who died at his home near Tokyo on April 28 at the age of sixty. Japan loses one of her most efficient sons, China one of her best friends and America an ardent admirer. Baron Ijuin reached the top of the diplomatic ladder last September when he was called from head of the Kwantung government general to direct the foreign relations of Japan in the Yamamoto cabinet. Here, with an efficient and loyal staff, every man of whom recognized the glorious opportunity to settle for all time the differences between their country and America, Baron Ijuin with his charming and frank personality welded the final link that he hoped would bind the two nations firmly together in a new understanding. From the empress and prince regent down through the cabinet officers and high dignataries of the empire to the lowly laborer in the street, they accepted the great catastrophe as a blessing that ushered in a new era in the Pacific.

It fell to Baron Ijuin as minister of foreign affairs at this time of profound national sorrow to speak for Japan and transmit her sentiments to the American people through their representatives in Tokyo. How well he did it can never be fully appreciated by a persusal of official communications. Only those who stood with bared heads while Ambassador Woods turned over the huge American army hospital at Tokyo and Baron Ijuin accepted the gift in the name of his emperor, his government and his people, and listened to his brief halting, half-choked words of gratitude, can understand how deeply he felt at this moment, which to him symbolized the termination of a long-drawn-out period of misunderstanding; a successful outcome to the propaganda initiated under his personal direction in 1920.

Ten years ago western journalists labored under the delusion that the Japanese government conducted a highly organized and widespread publicity service designed primarily to conceal their real policies behind a screen of platitudes and official denials of facts. At that time Japan was facing the preparations of an old enemy to resume the conflict of 1905. The military element were in control and they found many good reasons why a large measure of censorship was necessary to prevent vital information from leaking out of the country. The dispelling of this idea of Japan's secretiveness was due largely to the wise and efficient supervision of the foreign office information bureau by Baron Ijuin on his return to Japan from the Paris peace conference where he represented his country as one of the delegates. Previous to this he had held the post of Japanese ambassador at Rome and directed the inter-allied Japanese intelligence work in Europe during the war. Close contact with allied intelligence and propaganda methods equipped him to apply similar efficiency in the conduct of Japan's post-war publicity.



Baron Hikokichi Ijuin

We have several times come in contact with the much criticized Japanese propaganda system since Baron Ijuin assumed its direction; we have interviewed the officials of the information bureau of the foreign office from the highest to the lowest, and at all times have come away firmly convinced that it had only one fixed program. The high points of this propaganda were friendship with the United States and co-operation with Americans in Eastern Asia; sacrifices on the part of Japan to make the consortium a success; withdrawal from positions in China that would facilitate a better inderstanding with America in effect, a frank, friendly endorsement and cordial support to the policies of the United States.

Friendship with China was another cardinal feature of this new program but here its efficiency was impaired by a long series of misunderstandings, diplomatic blunders and regrettable incidents on both sides, aggravated by a hostile foreign opinion which influenced the Chinese to reject Japan's overtures for a better understanding. Japan's new policy towards China was modelled on the same lines as that of America, but owing to continued chaos, and internal warfare, it was difficult to apply any of the carefully considered plans that would carry conviction to the Chinese that Japan was their friend.

Baron Ijuin's oft reiterated advice still stands as the only solution to China's present problems and the inauguration of a new era in the relations between the two nations. "*Unite, Unite again and keep on Uniting*" was the message he sent at every conceivable opportunity to his Chinese friends through newspapermen who called to see him. It was good advice and not until China has a unified government representative of the whole country can Japan or any other nation manifest in a practical manner its real friendship for the Chinese people.

Open diplomacy, frank comment and friendly interviews with members of the Japanese and foreign press received its first trial in Japan under Baron Ijuin's direction of the foreign office information bureau. It worked wonders. The war cloud which hung over the Pacific paralyzing all constructive work was dispelled. Americans and Chinese alike awoke to a better conception of Japan's real aims and aspirations. To-day, she is better understood throughout the world than ever before. She has more friends, is more trusted and more highly appreciated since Baron Ijuin reversed her official publicity methods and took the world into his confidence.

Dyed-in-the-wool anti-Japanese will see nothing good in Japan's official propaganda. Many of her critics, however, are closely identified with Chinese propaganda and should the great Asiatic peoples become too friendly their usefullness would cease. Many Japanese editors and writers have severely criticized the publicity methods of their foreign office but all fair-minded foreign journalists will bear testimony to their efficiency. Five years ago when Baron Ijuin took over the direction of the official information bureau, Japan had few friends. World opinion was hostile; the public ready to believe any calumny upon her honor or exaggerated story of her activities. Never in history was a nation so isolated, so misunder-

stood or so handicapped in placing her case before the world. Baron Ijuin learned during the progress of the great war that world opinion is moulded by the English language press. Unless this press be sympathetic, no government may hope for approval of its policies. In four years, however, the new policies of Japan, her frank and honest avowal of past mistakes and a willingness to correct them coupled with a sincere desire to work in harmony with the United States transformed world hostility into a sympathetic understanding and a growing esteem. To the liberal leaders of Japan belongs the credit for this radical change in policies but the foreign press will always remember that it was Baron Ijuin's intelligent grasp on publicity methods that supplemented their work and made success possible. It is one instance where enlightened diplomacy working hand in hand with open publicity has pulled a great nation off the rocks.

Baron Ijuin lived to see the war clouds which hung over the Pacific cleared away. He rejoiced in the new understanding arrived at with the United States. His great task, however, was only partially completed. Not until China and Japan are marching ahead in close companionship and mutual understanding towards their great destiny in Eastern Asia will his work be completed. That day will come. It will be hastened by the application of the same enlightened policies on the part of present and future cabinets backed up at all times by a confidence that the press of the world will concede fair play to Japan as long as her cause is just. Ijuin's work will live and Japan will benefit in the future to a still greater degree from the new conception of publicity gained as the result of his supervision over the foreign office information bureau.

A grateful sovereign has recognized his merit. Posthumous honors elevate him to the second court rank, the Grand Cordon of the Rising Sun with the Crysanthemum was conferred and a sum of money donated to his family. The honors that come after death would have come in due time had he lived. Because of the rare merits which enabled him to carry out successfully one of the hardest tasks confronting any government since the termination of the great war he would have continued to ascend the official ladder to its topmost round.

GEO. BRONSON REA.

Worth a Trial

(Continued from page 213).

Shanghai Bank and said " why shouldn't the powers exercise the control in their power and hold up this surplus and use it for refunding the defaulted obligations incurred by the Anfu and other militarists in recent years ? Why not use it for that purpose instead of permitting it to be diverted for covering domestic bond issues the proceeds of which have likewise gone to military use ? "

Discussions over what is the best solution for China's troubles have already exhausted every possible and every impossible plan. It has taken years to get down to fundamentals and a realization that no scheme of reform is possible without a central government receiving the allegiance, support and revenues from a united country that will permit it to discharge its international obligations. The conference scheme has been tried and failed.

The foreign governments, fearful of losing contact with the keeper of the Waichiaopu pigeon holes are inviting the ruin of their nationals in business in China by continuing to hand over the customs and salt surpluses to the collection agency maintained in Peking by General Wu.

Foreigners are loudly demanding some kind of intervention, sending letters to chambers of commerce and other influential bodies at home to urge their governments to act. Intervention is a serious undertaking and could not succeed without the cordial co-operation of the Chinese themselves. Something will have to be done to terminate the long-drawn-out agony and business stagnation. Dr. Sun Yat-sen knows his China. His ideas have been endorsed by the highest British financial and commercial authorities. THE FAR EASTERN REVIEW has advocated this solution as the one practical way out of the present impossible situation. The withholding of all customs and salt surpluses from Peking will have a sobering effect on the militarists and compel their attendance at a conference that will settle their differences. It is worth a trial.

G. B. R.

Largest Turbo-Generator Purchased by Japanese Company

THE largest steam turbine generator ever sold by any manufacturer in the world for export has recently been ordered from the International General Electric Co. by Mitsui & Co. for the Toho Electric Power Co. of Japan, and comprises a G. E. Curtis impulse type turbine, developing about 50,000 shaft horsepower, with a generator rated 43,750 kva., 11,000 volts, 60 cycles. The order, including accessories and switchboard, represents an initial capital expenditure of more than $1,000,000. The unit will be located in the city of Nagoya, and provision is made for the future installation of an additional turbine-generator of same capacity.

The Toho Co., capitalized at approximately $70,000,000, holds a controlling interest in the Daido Electric Power Co., which in itself is one of the most important electric power amalgamations in Japan. Both of these companies are under the executive leadership of Mr. Momosuke Fukusawa, often styled the king of the hydraulic power industry and pioneer of electrical development in Japan.

The purchase of this large turbine generator is typical and but another example of Mr. Fukuzawa's progressive character as it was the Toho Co. that fostered and carried to completion the first " White Way " street lighting system in Japan—installed in Nagoya during the early part of 1923. Also in May 1923, at the Kawakami plant in the Kyushu district of the Toho Co., there was put in operation the first, and up to the present the only, automatic hydro-electric generating station in the Orient. The electrical equipment for these installations was also purchased either from the International General Electric Co. or its affiliated Japanese companies.

The Toho Co. practically controls the supply of power for lighting, industrial and railway purposes over a territory of approximately 13,000 sq. miles with a population of over 10,000,000. Their territory is divided into two main districts, Kansai and Kyushu. The former with its headquarters in the city of Nagoya (population 600,000) is the industrial backbone of Japan located in the central portion of the mainland and it is in this city that the present huge turbine will be located, while the latter is in the northern part of the island of Kyushu, west of the mainland. Up to April 1923 the Toho Co. owned 40 plants, steam and hydro-electric, with a total generating capacity of over 91,000 kilowatts which will be increased to over 150,000 kilowatts after the installation of the new equipments now on order. In addition, it purchases and redistributes from other companies over 45,000 kilowatts so that its influence on the industrial and social welfare of such an extensive community is of a most pronounced and vital character.

While this 43,750 k.v.a. turbine generator will furnish power for other than lighting purposes, it may help in visualizing its capacity to merely consider the small Japanese home with its average electric light consumption of about 35 watts, and to realize that this machine can supply enough power for 1,000,000 such homes.

The revolving field of the generator portion is made from a one-piece solid forging and is the largest and heaviest single piece which will be shipped. Its net weight is about 50 tons and approximate dimensions 27 feet by 4 feet diameter. In operation it will revolve at a speed of 1,800 r.p.m.

Recent orders placed with the International General Electric Company through their representatives, the Mitsui Company of Japan, covering a total of 78, 2,000 k-va. transformers, seem to point to a tendency towards standardization in the reconstruction work in Japan. The last order, placed by the Tokio Electric Light Company, covered 23, 2,000 kva., 50 cycle, single phase units with a voltage rating of 22,000/11,000 to 3,450. This is the second order placed with the International General Electric Company covering this rating of transformer. The previous order has been shipped and covered 55 similar units.

Tramway Developments in Eastern Asia

OUTSIDE of Japan, electric tramway development in Eastern Asia has not progressed beyond Seoul, Dairen, Tientsin, Shanghai, Hongkong, Hanoi, Saigon, Bangkok, Singapore, Batavia and Manila. Several new propositions are on the tapis while those for Chinese cities seem to encounter one delay after another postponing their completion. A tramway system for Canton has been a dream for the past twenty years and enough money has been expended in surveys, investigation and bribes to build a fairly sizable line in that port. The tramways of Peking are now being built and will operate some day.* Application has been made to construct tramways in Hankow and there is a long-drawn-out discussion taking place in Hongkong as to whether tramways or auto-buses are best for Kowloon.

Manila Tramway Extension

Meanwhile some of the older established companies are expanding. The Manila Electric Company will add $2,250,000 gold to its investments during the present year by lengthening its track 10 miles, purchasing 30 new cars and installing an additional 15,000 horse-power at its generating station. The present value of the company's holdings is P.30,000,000, P.10,000,000 of which has been added to the property account during the last 10 years.

The company has been able to reduce electric rates by 25 per cent. recently, placing them on a par with the average rate charged in the United States. This reduction has been effected by stokerizing the plant and introducing more efficient generating machinery.

In the transportation end the company has at present 52 miles of track and 148 street cars. These cars run 4,500,000 miles a year and carry 36,000,000 passengers or approximately 100,000 passengers a day. These figures show an increase of about 300 per cent. over first records.

The power plant has developed from a 2,300 horse-power installation, serving 3,478 customers to the present capacity of 20,000 horse-power serving 42,126 customers. With the 15,000 horse-power increase planned by the end of 1924 the company will be able to handle 50,000 customers.

The Manila Company employs 2,000 persons, with wages totalling P.1,800,000 a year, all of it spent in Manila. Local supplies purchased by the company amount to P.70,000 a month.

Trams *versus* Autobuses in Kowloon

The progress of the tramway scheme for Kowloon is shrouded in considerable mystery, but every now and then an insight is permitted into the working of the official machinery that gives a fair idea of how things stand. The fact was disclosed at the meeting of the Hongkong Tramway Company on February 27 last, says *The Hongkong Telegraph*, that a tender had been sent in by that concern for the rights of operating a system in Kowloon. It has been known for some time past that several companies have responded to the government's invitation for tenders, but there is still considerable doubt as to whether Kowloon will have any trams at all. The current colonial budget makes provision for expenditure in connection with the laying of the track, but from the remarks made at the budget meeting it would appear that the government itself is in doubt as to the relative merits of trams and motor buses. Before coming to a final decision the government is desirous of securing definite data on the comparative costs of establishing and maintaining tram and bus services, because this would be a factor in the eventual charges to be made to the public. It is for this reason that tenders were called for, says *The Telegraph*, the taking of such a step certainly does not imply that trams are to be decided upon."

"Our idea," continues this paper, "is that it would be a thousand pities to introduce trams in Kowloon. Apart from the disfiguring of the main roads of the peninsula, the adoption of such a system would not give the community nearly as good a service as could be obtained by motor buses, which are far more flexible and can be switched off to particular localities as and when the circumstances justify the tapping of new districts. There are many other reasons which could be cited in favor of buses as distinct from trams, and we are not without hope that the government will soon finally resolve to abandon the tramway idea and take steps to assure the community across the harbor a modern and adequate motor bus service."

The question has evidently degenerated into a conflict between the tramway and motorbus interests with the government caught in the middle and hammered by both parties. *The Hongkong Daily Press* in discussing the Kowloon traffic problem admits that it does not know quite what the present position is with regard to the proposed tramways. In the last budget a sum of $10,000 was provided "in respect of the laying of tramways in Kowloon," and in his general review of the budget, the governor explained that the proposal is that the government should lay the track and that the undertaking should be worked by private enterprise. Tenders had been invited accordingly. "The great demand which has sprung up in connection with the recently-established motorbus service," his excellency said, "is proof, if any were needed, of the necessity for finding an early solution for the traffic problem in Kowloon, and, if it should happen that satisfactory tenders in respect of a tramway service are not forthcoming, steps will be taken to establish a reliable service of motor-vehicles running to schedule and fixed fares to all parts of Kowloon and New Kowloon."

The Hongkong Tramway Co., in fact, have on many occasions applied to the government for a concession and were prepared to construct the tramway nine or ten years ago, but apparently the government's views as to the terms of the concession did not commend themselves to the company. In 1921 the government considered the question of a public motor service instead, and advertised for tenders. The Hongkong Tramway Company submitted a tender asking for a substantial subsidy, which they considered necessary to make a motor service on the conditions laid down remunerative. We do not know whether any other tenders were received, but no tender was accepted, and the motor-bus scheme was apparently abandoned in favor of the tramway project. Within the last three months we have seen an advertisement in Shanghai papers inviting tenders for the privilege of running a tramway service in Kowloon.

Meanwhile, "the necessity for finding an early solution for the traffic problem at Kowloon" is being increasingly emphasized. There is evidently more money in the motor-bus than the Tramway Company imagined when it asked for a substantial subsidy. It is no secret that the first motor-bus company which started in Kowloon found it to be a very profitable enterprise when once the management was entrusted to a competent European. The evident success of the pioneer company led to the formation of first one rival Chinese company and then another. At the present time three Chinese companies are operating in Kowloon, and we understand that they have between them some seventy or eighty busses. It is no uncommon sight to see from ten to fifteen of these queer-looking vehicles lined up at the ferry wharf competing for the traffic from the ferry. Presently the motor traffic on the streets of Kowloon is to be increased by a large number of taxicabs, and it has become high time that the government came to a definite decision as to regulating the traffic at Kowloon.

The motor-busses now in use are of a primitive type that we should like to see speedily eliminated. They have served a useful purpose in proving that a demand for this rapid means of transit exists, and these services, which have made the outlying parts of Kowloon more easily accessible, have no doubt encouraged much of the building development that is going on in what is called New Kowloon. But it is evident that fewer busses of a more commodious type would adequately serve the needs of the district. We notice that the pioneer company—the Kowloon Motor Bus Company—has just imported a greatly improved type of bus, capable of carrying probably forty passengers. It has not yet been licensed for service, as the authorities, we understand, are inclined to the view that it is too heavy for the roads, while the company's expert is trying to convince the authorities that its regulations in this respect would not be violated by the new type of bus, having regard to the distribution of its weight. We hope the roads of Kowloon are not so fragile as

* An article on the Peking Tramways will be published in our June issue.

to form an argument for the continuance on the roads of the slight, ramshackle-looking vehicles that now career over them. The need is obviously for busses of such a type as the one recently imported, but we imagine no company is likely to incur the expense of a fleet of such busses without the guarantees which go with a monopoly of the service. We take it that this is what the government had in mind when it intimated that if satisfactory tenders for a tramway are not forthcoming, steps would be taken to establish " a reliable service of motor vehicles," for it is a plain intimation that the government does not regard the present services as coming within that category. It is obviously desirable that the steps contemplated should include, amongst other things, a more modern and commodious type of bus than that now on the roads of Kowloon, and also fixed stopping places. We must confess to a wish to see this public utility in the hands of a British company employing a staff of competent technical experts, who could be counted upon to maintain the service in such a state of efficiency as the community has a right to expect."

Harbin Tramway Litigation

The situation surrounding the contract for the construction of the Harbin tramways seems to have been definitely settled by the signing of an agreement between the Beckman & Linden Engineering Corporation of San Francisco and the tramway commissioners making it impossible for the latter to assign, mortgage or otherwise encumber the original tramway concession granted to the American firm. The full text of this agreement reads:

" This agreement, entered into this 6th of April, 1924, by and between Suipandzi and the other concessionaires and The Chinese Harbin Electric Joint Stock Company, Ltd., first parties, and Beckman and Linden Engineering Corporation, second party, Witnesseth:

"Whereas, first parties, or one or more of them, are the owners of concessional rights, regarding constructing and exploitation of tramway and electric power plants for illumination of the city of Harbin, which concessional rights are set forth in a preliminary agreement between Harbin municipality and the above-named Suipandzi and others, dated January 24, 1922, which said preliminary agreement became final on July 1, 1922, Now therefore:

" First parties agree that they will not assign to other person or persons, either physical or juridical, their said concessional rights without first having received written consent of second party and that they will not mortgage or in any way encumber said concessional rights without first having received written consent of second party, and:

" Second party agrees that upon the repayment to it of all money with interest, paid or advanced in the furtherance of the physical work provided for in the said preliminary agreement dated January 24, 1922, then in that event and at that time this agreement shall cease and terminate and be of no further force and effect.

" In witness whereof, the parties hereto have set their hands and seals.

(signed) SUIPANDZI (Seal)

(seal of TSANG CHI-HUAI)

BECKMAN & LINDEN ENGINEERING CORPORATION,

By (signed) WILLIAM H. BISSETT, *President.*

Witnessed

(sgd.) LI SHAO-GEN.

Harbin, China."

The above document was signed at the office of the taoyin on April 6, and afterwards witnessed before the American consul by Mr. Li Shao-gen, foreign secretary to the taoyin. The document was then, on the same evening, filed with the city assembly. This document undoubtedly paves the way for some decisive action in starting work and smooths out the difficulties that have interferred with the American company in carrying out its contract.

Peking Tramway Troubles

The Peking electric tramway is being held up and lead-piped by the Peking chamber of commerce into paying a lump sum of $120,000 to erect two industrial plants where ricksha coolies thrown out of work by the operation of the trams may find employment. An additional sum of $5,000 a month is demanded to keep these institutions running. If not paid the tramway work will be boycotted by the chamber.

The Peking Electric Tramway Company is half government and half privately owned. It has a capital of $4,000,000 divided into 40,000 shares of $100 each, of which the Chinese government owns 20,000, the rest being subscribed for by private citizens.

The company is under the supervision of eleven directors of whom six are owners of government shares and five of merchants' shares. The directors for the government are appointed by the government, one of whom is the foreign manager of the Banque Industrielle de Chine. The directors for the merchants are selected from among the shareholders, each of whom must hold over 100 shares. The length of the term of office of directors is three years, subject to re-election. The chairman of the board is elected by the directors annually.

Two superintendents are in charge, one appointed by the government, and the other elected by shareholders holding over a hundred shares. Their respective terms of office are for one year.

After putting by a certain portion of the surplus for depreciation, within five years from the date of its formation, the company will pay the merchants' shares an annual interest at the rate of at least 5 per cent. on every share. In the event of the surplus not being sufficient to cover the interest of 5 per cent. the deficit will be made up by the government through other sources.

After deducting the depreciation and the 5 per cent. interest from the surplus of the company, over one-twentieth part of this surplus will be reserved as sinking fund, and the net surplus, if any, will be appropriated as follows: Shareholders' dividend, 60 per cent.; contribution to the public benefit of the city, 16 per cent.; bonus for employees of the company, 24 per cent.

All roads in Peking have been built and maintained out of license fees of shops and rickshas. During the past ten years over $3,000,000 has been spent on road work in Peking. The chamber of commerce now demands that that $3,000,000 should be refunded to them and they should not now pay any more license fees.

The Far Eastern Times says that a circular has been issued by the chamber of commerce, the Tramway Company had despoiled the hutungs and maloos built by taxes paid by merchants, and had laid rails through them, later offering to pay rental for the property over which their lines passed, promising that merchants should be exempt from further taxation as from January 1, 1924. The company, the circular adds, is now trying to evade these rentals, after much bargaining with the municipal council.

To what extent this passive resistance against payment of licenses will affect the company it is hard to say, seeing that all licenses are paid to the government, which, incidentally, owns half the shares of the company.

The attitude of the general chamber of commerce to the Tramway Company is that thousands of ricksha coolies will be thrown out of work. The Tramway Company points out, however, that the arrival of trams in Tientsin and Shanghai did not result in any reduction in the number of ricksha licenses, which were in fact considerably increased, this being due to the fact that several districts served by the tramway were incidentally opened to ricksha traffic.

It is stated that about eight months ago some prominent members of the Peking general chamber of commerce considered that they had a right to a certain number of free shares in the company. They moreover objected to the personnel of the board of directors, and as a result they bitterly opposed the advent of the trams. In addition to stating that ricksha coolies would be deprived of their livelihood, they declared that the roads in Peking were too narrow for tramway lines. The chamber of commerce has sent out over five hundred messages to jinricksha hongs in the capital instructing them not to apply for jinricksha licences, which were all due for renewal. This order will affect some 40,000 jinrickshas, and nearly 80,000 jinricksha pullers. The amount of the tax is 30 cents per jinricksha per month, aggregating $12,000. The chamber of commerce intends to defy the police to enforce collection.

This action is taken in order to bring pressure to bear on the authorities to arrest the tramway scheme, and no matter what the upshot may be, this defiance of public authority in the capital is a very significant development.

Singapore Tramways

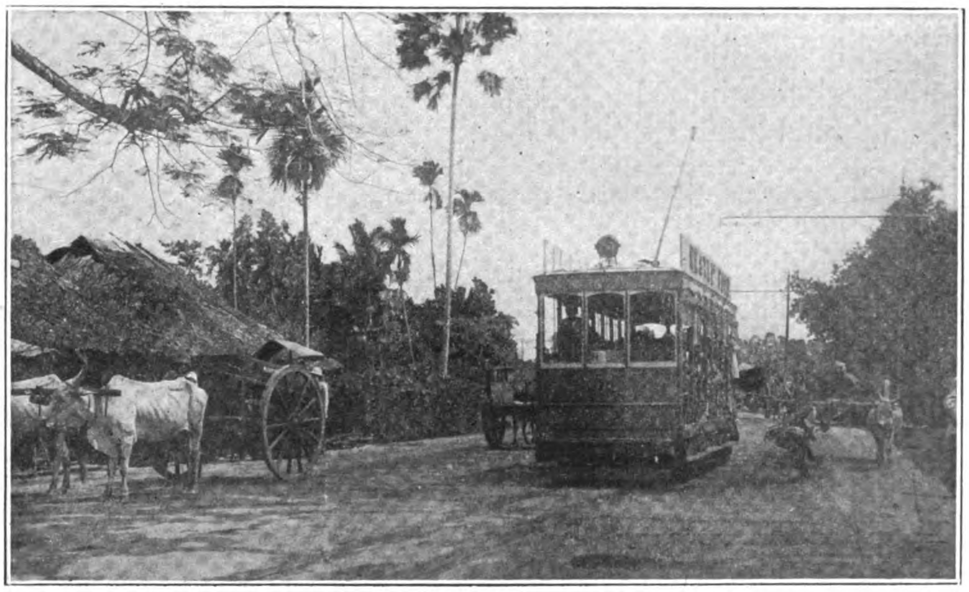
Rail-less Cars to be Operated

Negotiations between the Singapore municipality and the Shanghai Tramway Company, the conclusion of which will mark the dawn of a new era for traffic conditions in Singapore, are on the eve of completion, says the *Singapore Free Press.* Mr. D. McColl, the general manager of the Shanghai Tramway Company, is at present in Singapore for the purpose of discussing and settling various minor points in the negotiations. When these are concluded the work of removing the track of the present system, which has played such an effective part in bringing the Singapore roads to their present unsatisfactory state, and the reconstruction of the roads in preparation for the rail-less car service, which is to supersede the present system, will be immediately proceeded with.

Rail-less cars have been tried with considerable success in many of the principal cities in Britain. In no city has the service been more satisfactory than in Shanghai. Conditions here are more akin to Shanghai conditions than to those which exist in European cities, and there seems no reason why the success of the Chinese town should not be repeated in Singapore. It may reasonably be expected, at all events, that the change will have the effect of rendering possible the maintenance of better roads than Singapore is at present blessed with. Moreover, it should have the effect of reducing, if not entirely eliminating, the number of private-owned buses which render use of some of our principal streets an area of danger.

Route Reconstruction Begin

Details of the agreement that will finally be reached between the municipality and company are, naturally, not available for publication. It is understood, however, that the company will have full control of the service and will pay to the municipality a royalty of 2 cents per car mile, as well as 5 per cent. of the traction profits. It may, therefore, be reckoned that the company will pay a considerable part of the cost of raising the $2,400,000 required to reconstruct the sixteen miles of tramway roads. It is anticipated that that work will be completed within the next three years. It will be necessary to reconstruct each road in sections. Work has already been commenced with the Geylang Road, where land is being acquired for widening purposes.



Type of Car operated in the Singapore Tramways

The tramway roads will be reconstructed in the same manner as that which is being used for the making up of a considerable portion of the new bridge road. This system, known as the Trinidad Asphalt system, is not a new one, but it has not been widely used in Singapore. It consists of the laying upon the ordinary block foundation a top surfacing of 1½ inches of asphalt "binder." That is rolled in and is followed by the laying of a 1½-in. surface of asphalt "sheet." The "binder" consists of a mixture of stone and sand in the proportion of 2 to 1, with the asphalt; whereas the "Sheet" is a finer composition of coarse sand from one of the Dutch islands, a finer sand from Paya Lebar, and asphalt. For the effective use of the system the plant which manufactures the materials must be within eight miles of the scene of operations. The secret of the efficacy of the process is in the fact that the materials are thus able to be brought direct from the plant to the site with little loss of their extremely high temperature—in the case of the "sheet" 300 degrees Fahr., and in the case of the "binder" 250 degrees. The materials are laid and rolled at this high temperature and the result, as shown, in the cases of Trafalgar Street—the road which leads to the municipality depôt where the materials are manufactured—Alexandra Road and that portion of new bridge road which has been completed, is eminently satisfactory. A very hard and smooth surface is obtained, with more than a little resemblance to the solidarity of concrete. Unlike concrete, however, the asphalt can be laid with comparative rapidity. It is possible to open for traffic road that was laid on the previous day a feature of the process which should prove of considerable utility in the heavy program of work that is to be undertaken in the next few years. The new bridge road section had an unrehearsed test the other morning when a 12-ton roller and truck, with corrugated wheels, passed over a portion an hour after it had been opened, without harmful effect.

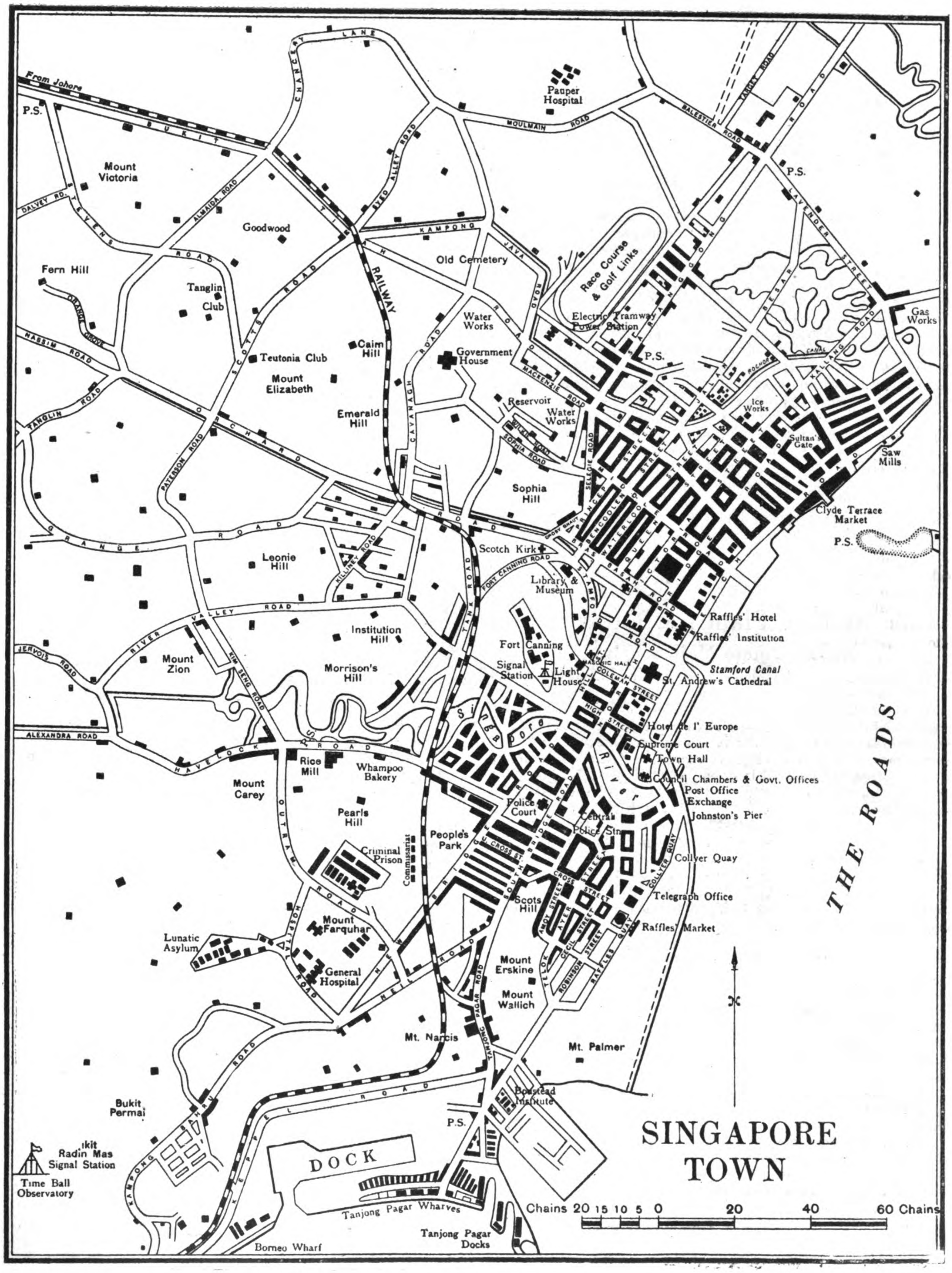
Improvements of the New Regime

The Shanghai company have been concerned with the management of the Singapore tramway system since October, 1922. Apart from the improvements that have been effected to the cars themselves, the following figures relating to the seven months from June 1 to December 31, 1923, are of considerable interest. They are of a character to induce some confidence in the ability of the new company to be formed in the near future to supply Singapore's transport needs adequately and with satisfaction. The number of car miles covered during this period was 914,408, compared with 693,723 during the same period in 1922. Although fares were reduced to such an extent as to work out at 3.75 cents per passenger, compared with 6.41 cents in the previous year, receipts increased from $198,056 in 1922 to $377,054 in 1923, an increase of 90 per cent. The total number of passengers showed an even more considerable increase of 225.62 per cent. from 3,090,795 in 1922 to 10,064,244 in 1923. For the first two months of this year the total number of passengers carried shows an even greater rise in comparison with the first two months of 1923, the figures being 947,672 and 3,279,531. Traffic receipts at $118,587, compared with $57,313 in the first two months of 1923 show an increase of 106.91 per cent., while the number of car miles covered indicates a greater service even than that of the last six months of 1923.

The Singapore Negotiations

The Singapore Company was registered in 1900; its only dividends, following a drastic capital re-organization in 1913, have been small payments made in 1916 and 1917. It has outstanding £271,700 of five per cent. debentures, interest on which is in arrear since 1921.

The company supplies the municipality with electricity and has suffered seriously from the continued operation of the power contract entered into with the municipality in 1913, the charges under which have remained virtually static in the period of high prices ruling since. The scheme now proposed is contingent upon the cancellation of that contract, and we understand that negotiations to that end and for the substitution of a new contract are well advanced. Indeed, an agreement in principle has been reached. The scheme now proposed involves the formation of a new company, to be managed by the Shanghai Electric Construction, Limited, and to be called the "Singapore Traction Company." The new company will have a capital of £400,000, one-half of which will be in preference shares, which, together with £103,000 in ordinary shares, will be allotted to the debenture-holders. The present ordinary


SINGAPORE TOWN
THE ROADS
From Johore
Pauper Hospital
Mount Victoria
Goodwood
Fern Hill
Tanglin Club
Teutonia Club
Mount Elizabeth
Cairn Hill
Emerald Hill
Old Cemetery
Water Works
Government House
Race Course & Golf Links
Electric Tramway Power Station
Gas Works
Ice Works
Sultan's Gate
Saw Mills
Clyde Terrace Market
Reservoir
Sophia Hill
Scotch Kirk
Library & Museum
Leonie Hill
Institution Hill
Fort Canning
Signal Station
Light House
Raffles' Hotel
Raffles' Institution
Stamford Canal
St. Andrew's Cathedral
Mount Zion
Morrison's Hill
Hotel de l' Europe
Supreme Court
Town Hall
Council Chambers & Govt. Offices
Post Office
Exchange
Johnston's Pier
Rice Mill
Whampoo Bakery
Mount Carey
Pearls Hill
Police Court
Central Police Stn
Criminal Prison
Commissariat
People's Park
Collyer Quay
Telegraph Office
Raffles' Market
Scots Hill
Mount Farquhar
Lunatic Asylum
General Hospital
Mount Erskine
Mount Wallich
Mt. Narcis
Mt. Palmer
Boustead Institute
Bukit Permai
Bukit Radin Mas Signal Station
Time Ball Observatory
DOCK
Tanjong Pagar Wharves
Tanjong Pagar Docks
Borneo Wharf
Chains 20 15 10 5 0 20 40 60 Chains

shareholders will receive 50,000 ordinary £1 shares in the new company, in the proportion of one new share for every eight old shares of 5s. each. The new company will obtain fresh capital by an issue up £250,000 of debenture stock.

Projected Mukden Tramway

There seems to be a possibility of the old horse car line running from the S.M.R. station at Mukden to the main gate of the Chinese city being converted into an electric line but there has been so much backing and filling over this proposed change that it is still possible that it will again be deferred. However, we are informed by *The Manchuria Daily News* that the Chinese authorities, with the backing of the gentry, mostly members of the Chinese municipal council, have decided at last to construct a tramway within the walls. The streets from outer west gate to west gate being too narrow, the proposed tramway is to start from west tower (Lama tower) reaching the north-eastern corner of the walls via Shenyang railway station, whence, turning to the south, proceeding to west gate via outer west gate by a new road to be built for the purpose. The road along the walls is to be 52 yards; from the north-eastern corner of the city to Shenyang railway station, the new road is to be 28½ yards.

With the announcement of the above decision, the land-owners have been assured of receiving a reasonable price for land expropriated, and warned to lay no obstacle in the way of the construction of the new tram on pains of a penalty.

The example of Tientain was held up as one worth copying. The idea was to raze to the ground the massive walls surrounding the city, in order to enclose the city with a peripheral line. But, Marshal Chang Tso-lin, the most powerful personage, in all Manchuria, equipped with the most progressive views, was the only dignitary who endorsed this idea.

The S.M.R. Co. proposed long ago to build a tramway from the railway station right up to the walls under Sino-Japanese joint management. This proposition failed to be accepted, and the railway people are to look after the railway town, as the Chinese will do with the rest. This arrangement will create the necessity for a change of car, and is to be regretted on that account.

Iloilo Project

Another project which may eventutate in the near future is the establishment of an electric tramway in the city of Iloilo, in the Philippines. About a year ago a bill was introduced in the Philippine legislature authorizing the city of Iloilo to acquire, operate and exploit an electric street car plant and system within its jurisdiction and the vicinity. The corporation to be formed was to be semi-governmental, 51 per cent. of the capital stock to be owned by the city, or in case of inability of the city to finance the project, by the provincial government of Iloilo.

Dairen Tramway Expansion

The Dairen tramways operated by the electrical department of the South Manchuria Railway Company are also being extended to cope with the rapidly growing transportation needs of that port. During the last fiscal year the railway company invested the sum of Y.800,000 in bettering and extending its lines and has set aside another Y.400,000 for the current year, bringing the total investment up to Y.4,500,000.

Hankow Project

Chinese merchants in Hankow are promoting a tramway company with a preliminary capital of $2,000,000, to operate a service, starting from the bridge, back of the Peking-Hankow Railway to Liu Kia Miao, near the Han River, a distance of 50 *li*. Rail-less trams will also be introduced. A plan has been drawn up and submitted for approval at the civil governor's yamên, Wuchang.

Cold Storage Plant for Manchuria

Japan's Future Meat Supply

THE entrance of the Kuzuhara Refrigerator Company, Ltd., of Tokyo into Manchuria marks another important step forwards on the part of Japan to solve the problem of her food supply. The people of Japan are turning more and more to beef to make up for the shortage in fish especially in the severe winter months when the catch is poor along the western coasts. The Kuzuhara Company one of the largest of its kind in Japan capitalized at Y.20,000,000, all paid up, has recently acquired the holdings of the East Asia Industrial Company in the Manchuria Ice and Cold Storage Company. The primary object of the Kuzuhara interests in invading this field is to operate several of its larger sized cold storage fishing vessels in the Gulf of Chihli, with Dairen as its base, but it will also push the export of Manchurian beef to Japan.

For a long time most of Japan's beef came from Tsingtao through the Okura Trading Company which operates the cold storage plant at that port.

The total value of beef exported from Tsingtao during the year 1923 amounted to some $2,300,000, an increase of $1,000,000 in comparison with the total value exported during the previous year.

The trade in beef is most brisk in winter, the cold weather assisting in keeping the quality intact until the time of delivery in Japan. This winter, the importers in Japan are vying with each other in an endeavor to show an enlarged turnover. Since the earthquake in Japan, beef, especially that imported from Shantung through Tsingtao, has replaced fish as the principal commodity, there being hardly an eating house in Japan that does not use beef as its chief item at present. In view of this increased consumption, dealers in beef in Shantung have found it difficult to cope with this demand. In the meat markets in Moji and Shimonoseki, the chief Japanese ports importing beef, Shantung beef stands unchallenged. The poor fishing in the neighboring waters of Shimonoseki, due to the cold weather, aids the marketing of Tsingtao beef in Japan.

From five to six hundred tons of beef are imported into Japan from Tsingtao on every steamer at the present time with the exporters clamoring for more space. In order to cope with the increased demand, a Japanese concern is starting to run a service of refrigerator ships, in addition to such well-known vessels engaged in the trade as the *Hanamet*, *Nisshin Maru*, *Kaio Maru*, *Shikotan Maru* and *Hakuai Maru*. The *Neisei Maru*, one of the regular liners, operating between Tsingtao and Japan, will shortly be replaced by a larger steamer, the *Harada Maru*, which has some refrigeration facilities to offer.

Slaughter House Charges

The Tsingtao slaughter houses charge $3 per head for slaughtering cattle and $1.75 per head for pigs.

The slaughter house is a Sino-Japanese undertaking, with a capital of $400,000. It is proposed that the company be turned into a public liability company, giving those who are not directly interested in the beef business a chance to participate as shareholders. Of the net profit of the company, 10 per cent. goes to the Chinese authorities who likewise impose an export duty of $1.70 per head.

The Chinese authorities, following the indiscriminate killing of cattle, are now exercising strict control, in an endeavor to stabilize demand and supply.

The beef supply of Shantung is limited and it is from Manchuria and Mongolia that Japan must eventually seek its heavy food requirements. This must follow the installation of a large modern central cold storage plant and the adoption of refrigerator cars and space in steamships. It is here that the Kuzuhara interests will find an outlet for their activities.

The S.M.R. as usual is keeping in close touch with this development and its engineers have devised a new type of refrigerator car which may be converted at will into refrigerator or santhermic purposes.

On their trial test, the temperature inside the car was kept at 4 deg. C. while that outside happened to stand at zero. The interior of the car is lined on the sides and the roof with asbestos. Each car has a capacity of 22 tons (American) and is specially contrived to carry beef put out from 90 head of cattle, in quarters.

The novel feature of these refrigerator cars is, as above stated, to be converted for santhermic purposes, for instance, for carrying fresh fruits and like perishables susceptible to the freezing temperature.

Three more cars of the same pattern are being built at the Shakoku Workshops.

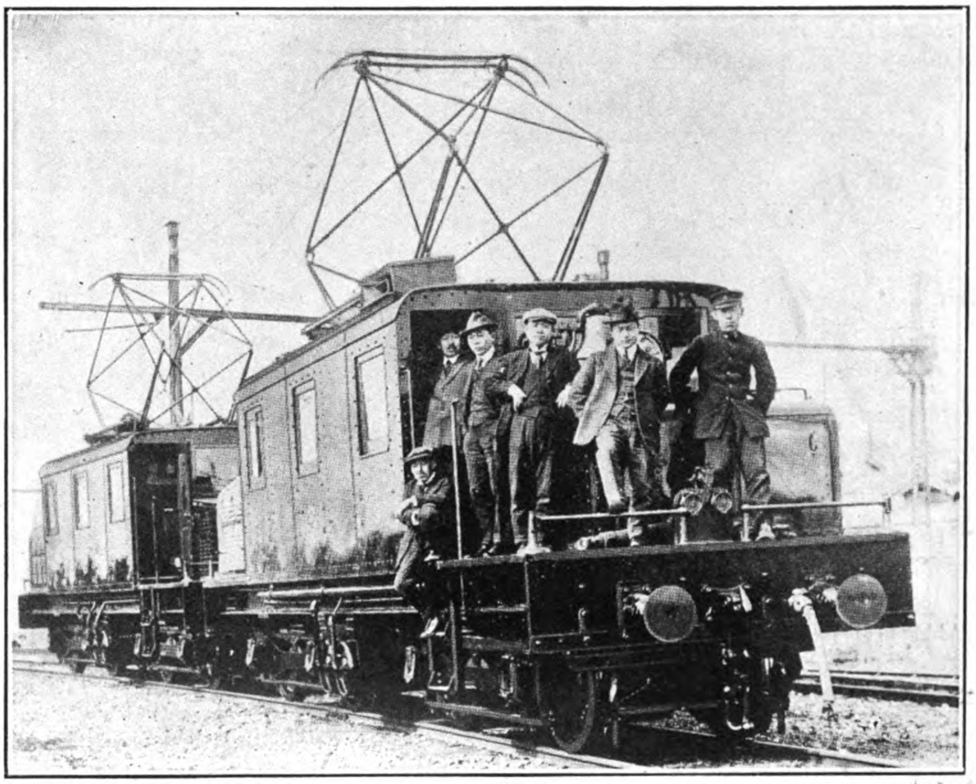
The S.M.R. has five refrigerator-cars in use and 10 cattle-cars.

When all these become operative, beef, pork, fish, fruits, and vegetables may be exported and imported without risk of damage being done to the perishables by the weather year in and year out.

Electric Locomotives In Japan

WHEN the early railways of Japan were built the 3-ft. 6-in. gauge was adopted as the standard, but as the traffic of the empire grew, the demand for movement could not be met by additional train service because of the limitations fixed by the gauge. The remedy lay either in the costly construction of additional trackage, change of gauge, or adoption of some type of motive power other than steam. For many years the question of changing the gauge to standard with its immense cost came regularly before the diet and it was only last year that this railway problem was definitely taken out of politics and a basic law passed fixing the gauge at 3-ft. 6-in. and authorizing a program for the electrification of the government railways in which the great water resources of the country will be called upon to furnish the power.

The congestion on the suburban lines of Tokyo was becoming particularly serious and this section was therefore selected for the initial electrification anticipating a greater volume of train movement in the near future with added traffic complications. One potent factor in arriving at the decision in favor of general electrification was the fast spreading development of hydro-electric power and the consequent possibilities for the conservation of the nation's coal supplies for industries which could only be operated by steam. The plans as perfected to date, call for the utilization of hydro-electric power during the next five years on from 500 to 700 miles of main line track.


A Baldwin-Westinghouse Electric Locomotive on the Chichibu Railway, Japan

The first step in this far-reaching plan was the electrification of the main lines out of Tokyo, where the local traffic conditions and the narrow gauge of the railway called rather for the operation of a number of light trains running at high speed at frequent intervals, than for a limited number of heavy trains at long intervals. After a careful study and investigation the 1,500 volt direct current system was decided upon as the basis of general railway electrification. It is now planned to handle the greater part of the passenger traffic by multiple-unit cars, reserving the locomotives for the long runs.

The present electric service between Tokyo and Yokohama is being extended to Odawara and a branch line from Ofuna, about ten miles from Yokohama, will terminate at the naval base at Yokosuka. The main line proper from Odawara westwards is also being electrified. In connection with this main line electrification the railway authorities have placed orders for several types of locomotives. Of these thirty six were ordered from the English Electric Company, two from the General Electric Company, two from the Westinghouse Electric Company and two from Brown, Boveri and Company.

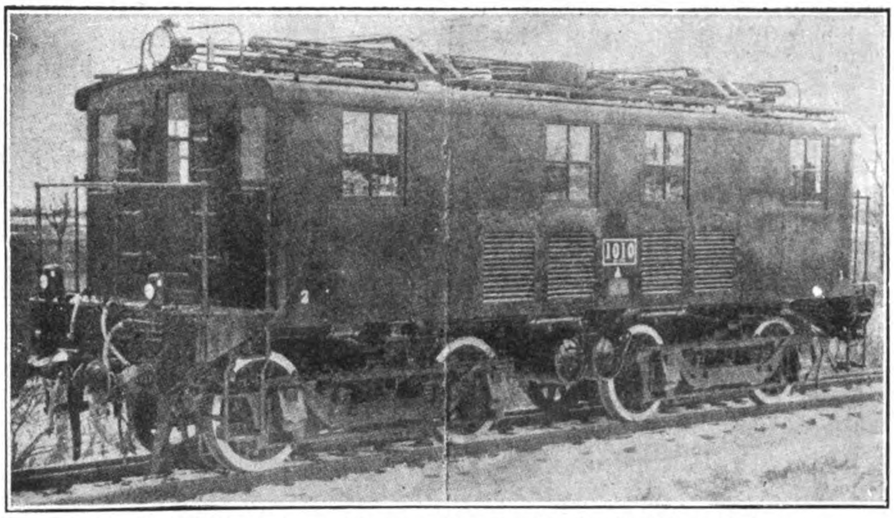
Eight of the locomotives from the English Electric Company are of the 4-6-4-4 type and the remaining 28 of the 0-4-4-0 type and have motor equipment of 1,200 h.p. The larger locomotives, the mechanical parts of which were made by the North British Locomotive Company, are to be employed in express passenger service. When first they are put into operation they will take trains from Tokyo to Kozu, a distance of some 50 miles, stopping about half-way at Yokohama. Eventually, however, they will run to Odawara over the new direct route to Numazu, 80 miles from Tokyo and about 4 miles beyond Mishima, the connecting-point between the new line and the original main line.

As the gauge of the lines over which the locomotive works is 3-ft. 6-in., and as the service demanded required a high power, amounting to 1,800 h.p. at the one-hour rating, the question of the motor arrangement and drive required much consideration. The arrangement adopted will be clearly seen from Fig. 1 on page The conditions imposed by the narrow gauge operated in the direction of limiting the size of motor which could be carried between the frames, and accordingly six motors were adopted. These are each of 306 h.p. on one-hour rating. The line pressure is 1,500 volts direct current, and the motors are of 750 volts each and are run two permanently in series. A gear drive is used, and the arrangement follows closely that commonly utiliezd in connection with multiple-unit passenger coaches. The whole motor and gearing arrangement is a simple and neat one, as will be clear from Figs. 1 and 2 in conjunction with the end view and cross-section given in Figs. 3 and 4. The general wheel arrangement is well shown in Fig. 1,

The underframe is carried on two trucks, each equipped with three driving axles and one swivelling bogie. The driving wheels are 4-ft. 7-in. in diameter, and the driving axles are each driven independently by a motor. The total weight of the locomotive is 100 tons, there being about 12 tons on each driving axle and 7 tons on each axle of the leading and trailing bogies. Compensation is provided between two axles only on each truck. As will be clear, the wheel arrangement of the locomotive is symmetrical about the centre line. The control of the locomotive is carried out on the English Electric Company's camshaft system. The electrical arrangements consist, briefly, of a main camshaft controller, and is operated by an electric motor which is controlled by a master controller. The camshaft controller handles the main 1,500-volt current, regulating the amount of resistance in the motor circuits and determining the grouping of the motors. It consists of a series of steel cams mounted on a mica-insulated steel shaft. The electric motor drives the shaft through a flexible drive and worm gear, and as the cams are set at different angles, each in turn closes a contactor, the contactors regulating the amount of starting resistance in the main circuit and determining the grouping of the motors. The order of operation of the contactors is determined by a purely mechanical arrangement, so that it is impossible for them to close in the wrong order and no interlocking arrangement is required. An interlock is, however, provided on the line switches, so that the camshaft cannot begin to rotate in a forward direction until the line switches have closed, nor in a backward direction

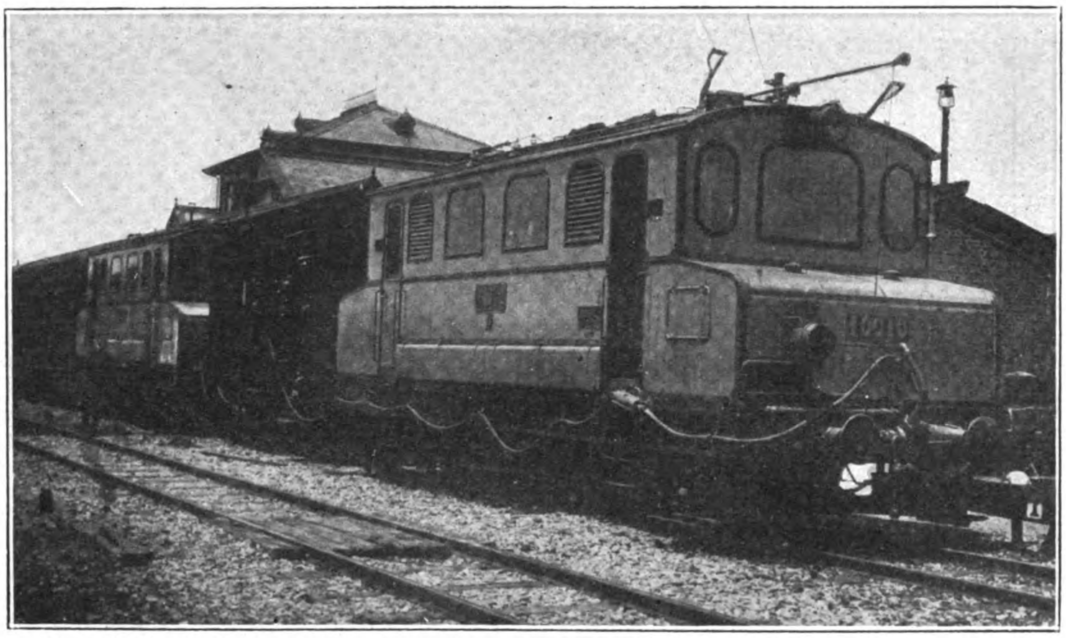
until they have opened. The main current is consequently always made and broken on the line switches only, and the camshaft contactors require neither blow-outs nor arc shields.

The apparatus in the main 1,500-volt circuit consists of the pantograph current collectors with choking coils, an isolating switch and main fuse, the magnetically operated line switches (which, as mentioned above, are interlocked with the camshaft controller), the camshaft controller itself, and the magnetically operated reversers, which are in the main circuit between the main motor armatures and the fields. They are indicated in the diagram of connections given in Fig. 5. The pantographs are raised by compressed-air cylinders operated from the brake compressor in the usual way. Each of them is capable of collecting the whole current required by the six motors. The high-tension control apparatus is situated in compartments arranged along each side of the locomotive body, as indicated in Fig. 4. Sliding doors are arranged to cut off these compartments from the remaining part of the interioı of the locomotive body, and the doors are interlocked with the main isolating switch, so that it is impossible to obtain access to the high-tension gear when it is alive. The switches have magnetic-shield blow-outs and are closed against a spring, so that there is no time lost in opening,



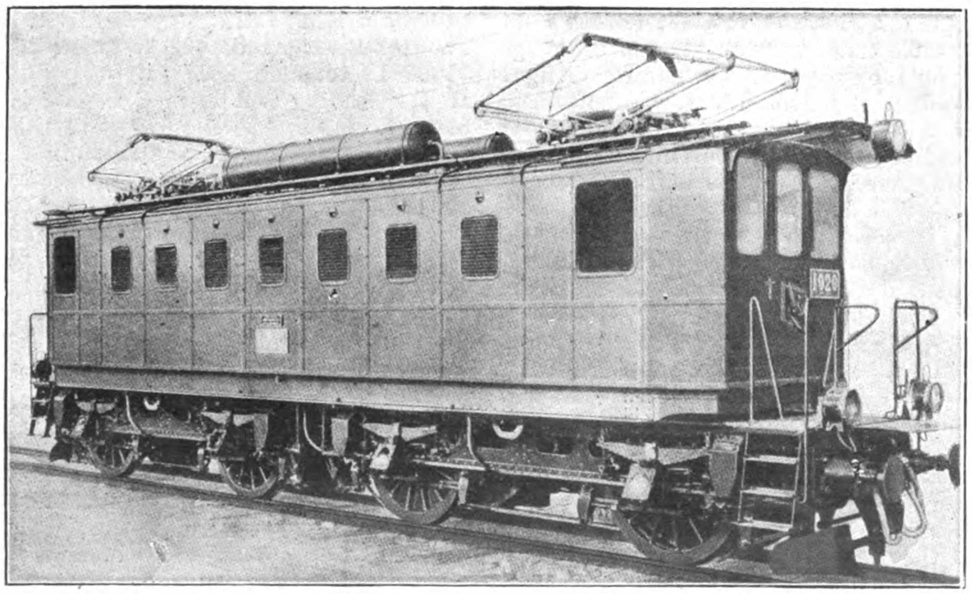
1,500 volt, 1,040 h.p. General Electric Locomotive for the Imperial Japanese Government Railways

The control current is obtained from the 100-volt side of a motor generator which is in the centre of the locomotive body, and can be seen in Figs. 1 and 2. Current is taken from this generator to the master controller at each end of the locomotive. The two controllers are similar, and the locomotive may be driven from either of them. From the master controller current passes through the train wires to the position regulator on the camshaft controller, and from thence to the motor which drives the camshaft controller. The position regulator is in the form of a drum-type switch. As the master controller is operated, the camshaft-controller motor is started and moves the camshaft controller into the position determined by the master controller. When the camshaft controller reaches this position the armature of the camshaft motor is short-circuited by a relay, the energising of the relay being determined by the position regulator. This short-circuiting brings the camshaft to rest instantly and without any hesitation or over-running. A 20-volt relay is provided in connection with the control circuit, and if the line supply fails the master controller must be brought back to the starting position, before power can again be supplied to the main motors when the supply is restored. The line switches are tripped when the master controller is brought into the zero position. These switches are provided with an overload relay which is closed from the driver's compartment. They can only be closed when the master controller is in the zero position.



One of the A. E. G. Electric Locomotives placed in operation on the Yokozawa-Karuizawa section of the Imperial Japanese Government Railways in 1912

The motor of the motor-generator set is fed from the 1,500-volt line. The controlling apparatus consists of an isolating switch interlocked with the door of the high-tension compartment and an automatic starter consisting of three small contactors and a starting resistance. A reverse-current relay is incorporated in the circuit, since if the live voltage dropped suddenly the inertia of the set would cause the motor to feed back into the line. This relay inserts resistance in the circuit and safeguards the motor. This motor of the motor-generator set, besides driving the 100-volt generator which supplies the auxiliary circuits, also



One of two Brown Boveri Electric Goods Locomotives supplied to the Imperial Japanese Government Railways in 1,923. 1,380 h.p., 1,500 volts, direct current

1,800 H.P. 4-6-6-4 TYPE ELECTRIC LOCOMOTIVE FOR THE IMPERIAL JAPANESE RAILWAYS

BUILT BY THE ENGLISH ELECTRIC COMPANY, LTD., LONDON

(From Engineering)

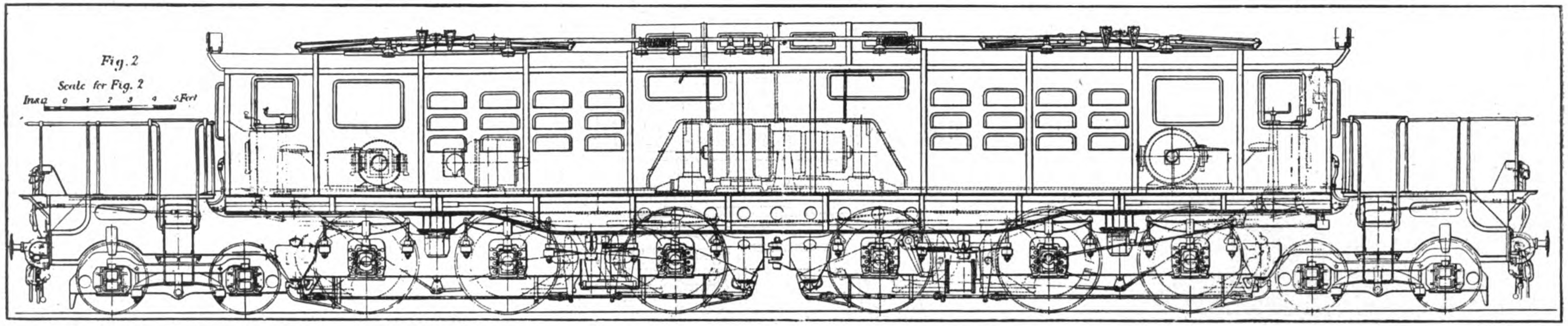


Fig. 1

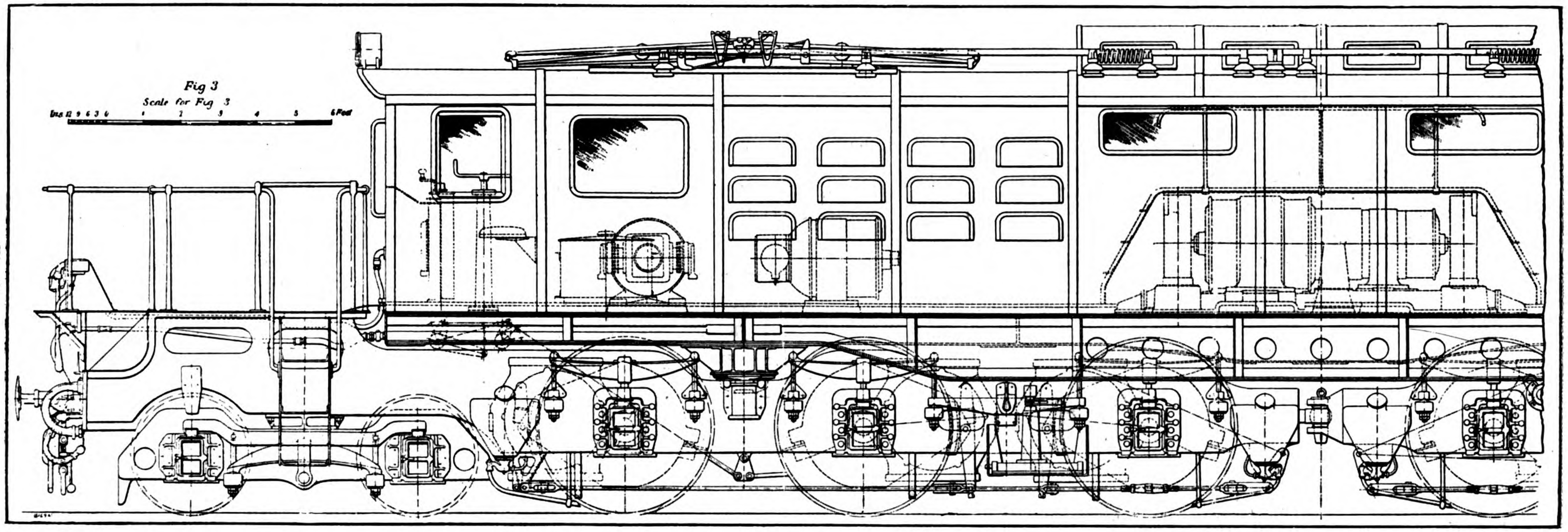
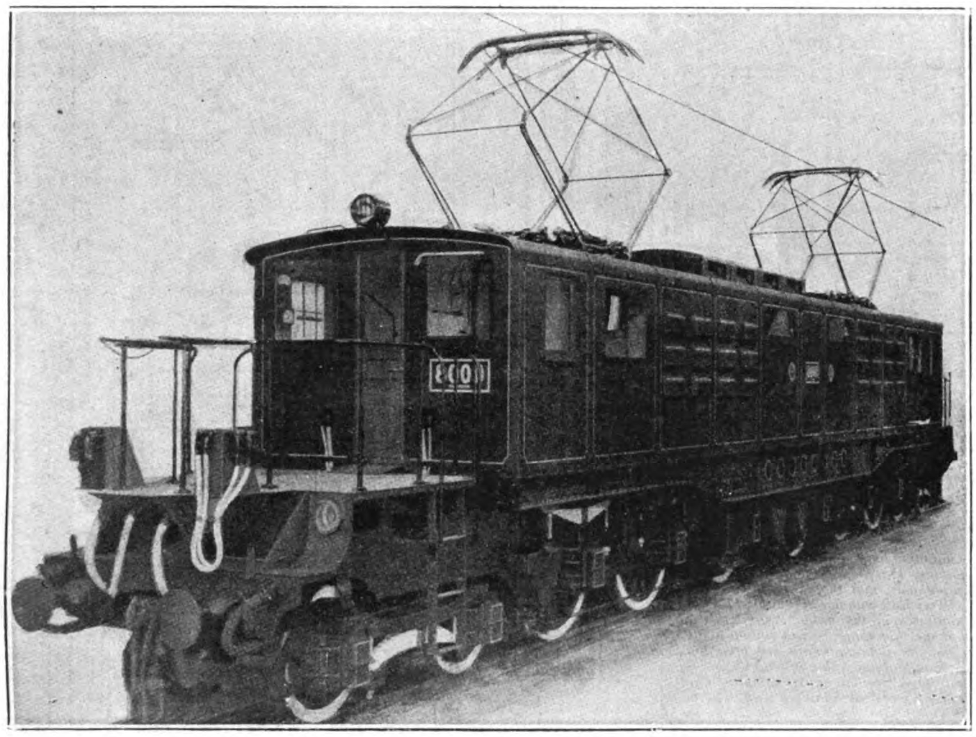


Fig 2



English Electric Company Locomotive for the Japanese Railways

drives two fans which are carried one at each end of the set, as shown in Figs. 1 and 2. These fans supply forced ventilation air from the main motors A stand-by supply for the auxiliary circuits is furnished by a battery carried by the locomotive, this battery having sufficient capacity, to operate for four hours in case of failure of the motor-generator set.

The locomotive is fitted with automatic air brakes, and the compressor motors are supplied from the 100-volt auxiliary circuit. A vacuum exhauster is also driven from the same circuit. This exhauster is required for use in connection with the operation of the vacuum brakes on the existing passenger stock. Ultimately it is the intention to change over all stock on the Japanese railways to compressed air brakes, and when this has been carried out the exhausters will be removed from the locomotives. Two or more of these locomotives can be run in multiple unit and driven from a single master controller. The draw-gear and couplings are made to the Japanese railway standard, but arrangements are made so that the present gear can be removed and M.C.B. couplers fitted if desired.

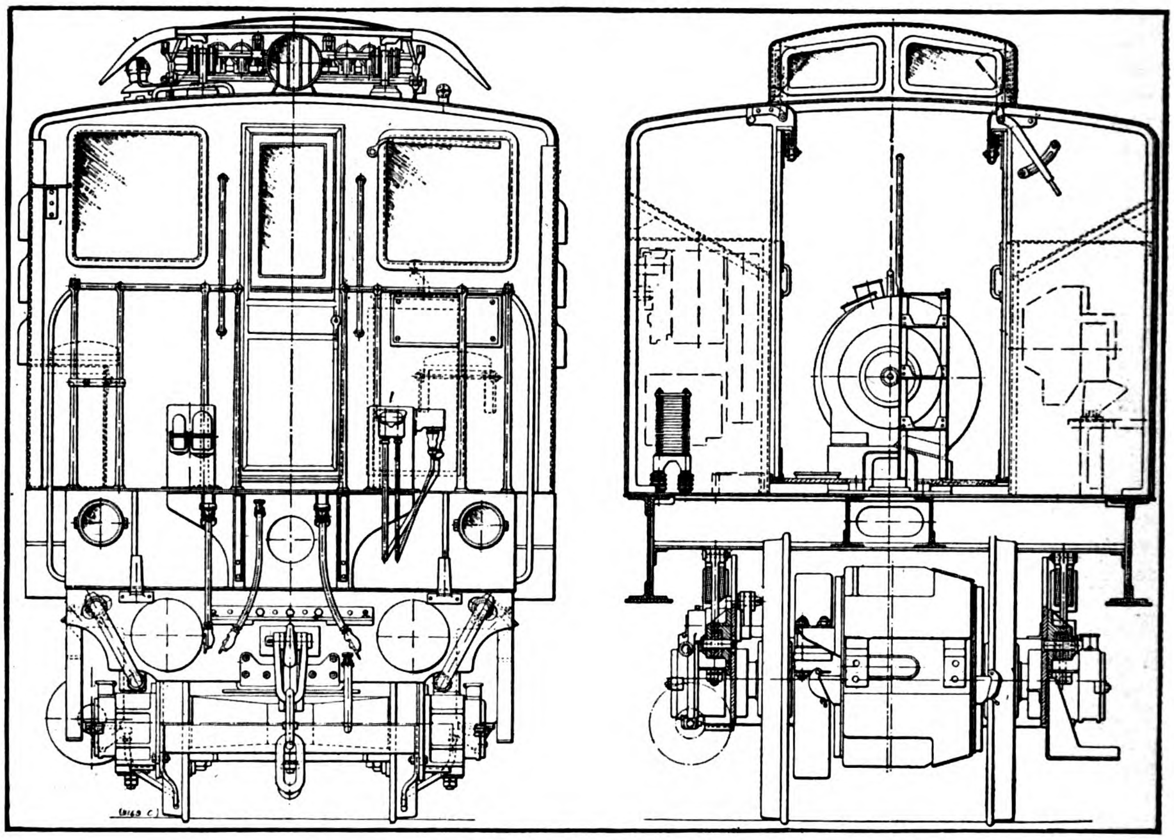


Fig. 3 Fig. 4

Baldwin Westinghouse Locomotive

The two Baldwin-Westinghouse electric locomotives furnished to the Japanese government railways are now in service near Tokyo. Designed primarily for local freight service over lines having heavy grades they may be operated in multiple as a road freight locomotive of 121 tons dead weight. Following are the principal dimensions of the two locomotives: Weight, 120,950-lb.: Weight per driving axle, 30,240-lb.: Diameter of wheels, 49 in.: Rigid wheel base, 9-ft. 1-in.: Total wheel base, 29-ft. 4-in.: Maximum speed, 40 m.p.h.: Starting tractive effect, 30-240-lb.

Two axle hung motors, inside hung and direct geared to the axle, are carried on each truck. These locomotives will be given close supervision while in service with a view to the acquisition of data concerning actual traffic requirements as well as of operation before determining the extent of the general electrification and the type of equipment on the government lines.

In addition to the locomotives supplied by the Baldwin-Westinghouse companies to the government railways several are in operation on the Chichibu railways, a system traversing a district rich in the natural wealth of mines and quarries and noted for its production of raw silk.

For many years this railway was operated under steam power, but increasing freight movement and the ever-present fuel problem made it imperative to seek a solution of the power difficulties. Moreover, the development of electric plants in this district had been rapid and an ample supply of current was ensured. After a careful consideration, therefore, of all the operating factors, a decision was made calling for the electrification of the line from Kagemore to Kumagaya, a distance of 35 miles of main line.

Power is supplied by the Musashino Electric Power Company, transformed through two substations to 1,200 volts direct current.

Three multiple unit cars, equipped by the Westinghouse Company, will be operated in passenger and express service. Five Baldwin-Westinghouse electric locomotives were shipped in October 1922, to handle mixed freight and passenger trains, which as a rule consist of four passenger cars and fourteen goods cars, making a total of approximately 204 gross tons. The electric locmotives are of the 0-4-0+0-4-0 non-articulated type, built for 3-ft. 6-in. gauge track with 38-in. wheels. They weigh approximately 82-150-lb.

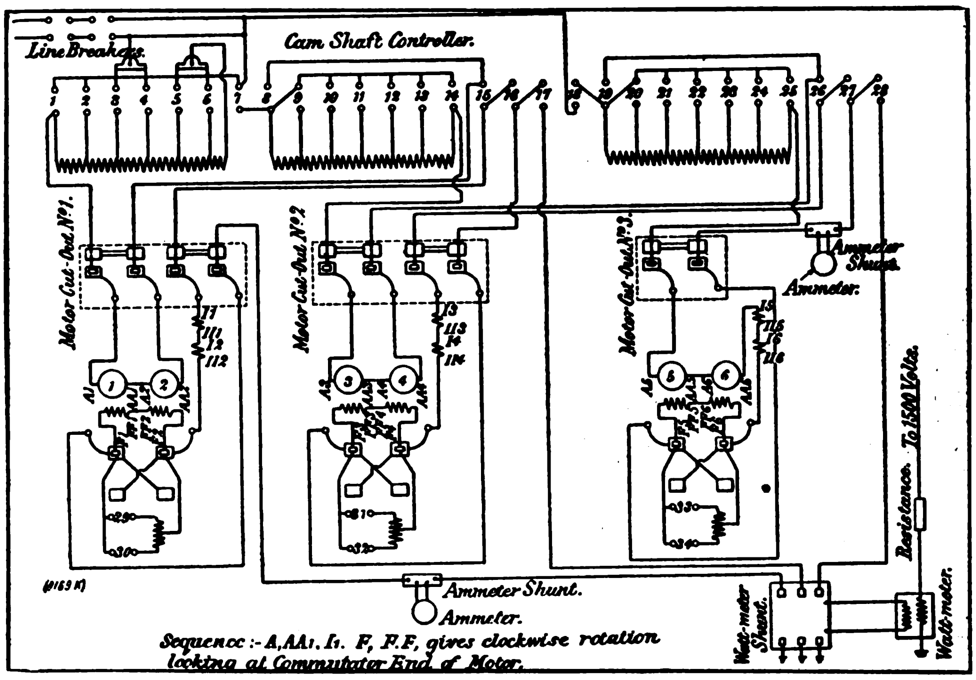


Fig. 5

The latest activity of the Dock is the securing of an order from Messrs. G. S. Yuill & Co., of Sydney for two vessels to go on the Hongkong Australia run. These boats will be about the size of the Changsha and Taiyuan which they probably will replace, as the two vessels have been on this run for almost 40 years. The new steamers will be about 350 feet long and have accomodation for 50 first, 30 second and 20 third class passengers. The steerage will be fitted to take 200. The cargo capacity will be 4,000 tons with two holds fitted as refrigerators for frozen meat.

* * *

General Electric Locomotive

AT the same time that the order for the English electric locomotives was placed the Japanese government railway administration ordered two from the General Electric Company of New York, two from the the Westinghouse Electric Company and two from Brown, Boveri & Company. The General Electric locomotive illustrated on page —was made at the Erie works of this company and is of the box-cab type, equipped with four GE-274 750/1,500-volt motors, geared for a maximum speed af 40 m.p.h. Its total weight is 132,000-lb., all on driving axles, and it is capable of exerting a tractive effort of 17,000-lb. on the one-hour rating. The continuous rating gives a tractive effort of 17,400-lb. at 22 m.p.h., with 1,500 volts on the trolley. In addition to the 1,500-volt rating the locomotive can be operated at 1,200 volts at a somewhat reduced capacity, and provision is made for operation at 600 volts direct current by the throwing of a commutating switch which connects all four motors in parallel. They are permanently in series for 1,500-volt operation. Protective devices are supplied to prevent damage due to accidental contact with the 1,500-volt trolley when the commutating switch is thrown to the 600-volt connection. The leading dimensions of the locomotive are as follows:

Length over all	37-ft.	2-in.
Length of wheelbase	26-ft.	0-in.
Rigid wheelbase	8-ft.	6-in.
Height over pantograph (locked down) ..	12-ft.	10-in.
Diameter of wheels		42-in.
Gauge of track		42-in.

The GE-274 motors were designed especially for this locomotive and are the largest so far constructed for a 42-in. gauge track. Each motor rates 260 h.p. on 750 volts, and is insulated for operating two in series on 1,500 volts. The motors are arranged for ventilation by means of external blowers.

One of the most interesting features of the equipment is the new electro-pneumatic type of control known as Type PCL. Two master controllers, one in each operating cab, energize the magnet valves of the pneumatically operated contactors, which open and close the main motor circuits. These contactors are closed by air pressure and opened by a heavy spring acting against the pistons. control steps are provided with four motors in series and eight steps with the motors in series-parallel.

Another important feature of this equipment is the high-speed circuit breaker, which is connected between the trolley and the main part of the locomotive equipment. Under normal operating conditions this circuit breaker is closed automatically on the first point of the master controller; it then remains closed unless tripped by an overload or short circuit or by momentary loss of the control circuit voltage. After being tripped for any reason, the breaker is again reset upon the first point of the master controller. Under normal operation, however, the high-speed circuit breaker does not open with the return of the controller to the off position. This circuit breaker has no mechanical latches or triggers, but is tripped electro-magnetically. This construction makes for durability and permanence of calibration.

To protect the locomotive motors against damage due to overload, an overload relay is provided, which is so connected that in case the motor current exceeds a certain predetermined value, the relay contacts open the holding circuit of the high-speed circuit breaker, which then opens and thus relieves the overload.

For collecting the 1,500-volt current, twoslider pantograph trolleys (one a spare) are provided having a range of 7-ft. from minimum to maximum height. These pantographs are raised by admitting air to a set of cylinders and are held against the wire by springs, which are in turn held under tension by the compressed air in the cylinders. The contact elements consist of easily renewable copper wearing strips. A hand pump supplies compressed air for raising the trolleys for initial operation when there is no air pressure on the locomotive.

The control current is provided by a dynamotor arranged to supply 750 volts for the low-voltage control circuits and lights. In conjunction with this dynamotor there are two air compressors designed for 750-volt operation, but doubly insulated. The middle point of the air compressor circuit is connected to the mid-voltage point of the dynamotor to insure equal division of the load between the two compressors. The two blower motors for ventilating the traction motors are also designed for 750 volts each and are doubly insulated.

In the engineer's cab the master controller is located on the left side of the cab to conform to the practice in Japan of running to the left instead of the right.

New Philippine Corporation

Among the new domestic corporations registered in the Philippines recently is the Manila Cordage Company whose capital of Pesos 1,000,000 is to be used in the growing and manufacture of hemp and other fibres. Captain H. L. Heath, for many years one of the most prominent hemp exporters, is one of the incorporators. The Lucban Electric Company incorporated for Pesos 100,000, will operate a light and power plant in the municipality whose name it bears. William T. Nolting, president of the Bank of the Philippine Islands, Leopold Kahn, N.E. Merchant, E. B. Ford and Gregorio Araneta are the incorporators.

Among the more prominent foreign firms who have registered in Manila recently are:—The Asano Cement Co., capital Y.35,750,-000, Agent Takatomi Moriyama; The American Insurance Co., of New Jersey, Capital Pesos 6,000,000, Agent E. E. Elser, to do a fire and marine insurance business; The National Fire Insturance Co., of Connecticut, capital G.$2,000,000, Agent E. E. Elser.

The Pipe Line and Workings at Gopeng Consolidated, Limited, in the F.M.S.

Paper Read Before the Engineering Association of Malaya By A. G. Glenister, A. Inst, M. M.

I SEE that I am down for a short paper on the pipe line and workings at Gopeng Consolidated, Ltd. The subject is, however, a very large one and so, thinking as I do that more or less complete details of the main pipe line and main workings are of greater interest to you than a sketchy description of the whole, I shall confine my remarks to a description of the Kampar water supply pipe line and the workings at the Lallang section.

The water supply of the mine is obtained from three pipe lines:—

1. The Kampar water supply which furnishes an average of 6,000 cubic feet per min., 4,000 cubic feet of which are used by Gopeng Consolidated, Ltd., and 2,000 by Kinta Tin Mines, Ltd.
2. The old Gopeng supply which furnishes an average of 600 cubic feet per min.
3. The new Gopeng supply which furnishes an average of 500 cubic feet per min.

The total water is divided almost equally between the Serdang and Lallang sections which are separated by the Gopeng-Kota Bharu Road.

The average monthly yardage treated by both sections is 120,000 cubic yards.

Kampar Water Supply—Pipe Line

Drainage Area.

The intake is on the Kampar River about 7½ miles from Gopeng. The drainage area above the intake is covered by thick jungle and covers an area of approximately 39,400 acres at an elevation varying from about 900-ft. at the intake to 6,910-ft. on the watershed between Perak and Pahang. The sides of the mountains are steep and the general flow off is due west. The bedrock is granite with an overburden of clays and gravels.

Flow-Off.

The rains commence at the end of September or the beginning of October and from then onwards to about the end of June, the flow-off varies from 6,000 c.f.m. to large floods. Careful records were kept in 1912, and in that year the largest flood recorded was 25,000 c.f.m., while similar floods have been experienced since. It is possible that exceptional floods of three or four times that amount occur at long intervals. During the months of July, August, and the first part of September the flow-off, under normal conditions, is less than 6,000 c.f.n. The lowest recorded flow in the year 1912 was 2,700 c.f.m. (September 18th) but it may be regarded that 6,000 c.f.m. is the average supply.

The average flow-offs for the dry months of 1912 were:—

June	7,000 c.f.m.
July	4,900 c.f.m.
August	3,600 c.f.m.
September (dry part)	3,000 c.f.m.

It should be noted that the above observatins are very general so far as distribution of flow-off is concerned and there may be exceptional dry periods during any month of the wet season when the flow-off will be less than the average limits. I would mention that the total rainfall for the year ended September 30, 1921 was 95.54-in. at the intake and 91.79-in. at the mine.

Intake Works.

The intake works consist of a concrete dam built across the river bed and founded on the solid granite, with an overflow 155-ft. in length to provide for exceptional floods. The dam is 45-ft. high at its highest point measured to crest of overflow at the highest, and the average height is about 30-ft. The supply to the pipe line passes through iron gratings, which are provided to keep back floating logs, into the settling basins. Through these basins the water has a velocity of one foot per second. Experiment has shown that even if the finer sediment deposited on the floor of the settling basin were to enter the pipe line such sediment would not have any appreciable effect on the metal. From the settling basins the supply overflows into the outlet chamber and the water enters the pipe through a bellmouth.

Pipe Line.

The pipe line is 45-in. diameter through, and is designed to convey 6,000 c.f.m. to the mines at Gopeng, giving a working pressure of 150-lb. per sq. inch.

Diameter of pipe	45-in.
Area of pipe	11.04 sq. ft.
Length of pipe line	41,018-ft. *i.e.* 7.77 miles (hor)
Velocity of water in pipe	9-ft. per second.
Quantity flowing	100 cu. ft. per second.
Total head from Intake to No. 2 Meter House...	612-ft.
Total head from Intake to the Kampar Road ...	640-ft.
Head lost in friction	266-ft.
Available head at mine	346-ft=
Hydraulic gradient	1 in 154.
Brake horse power developed	3,300 approx.

The pipes were constructed by the Mephan Ferguson Lock Bar Pipe Co., Ltd. The plates for the barrel were rolled in two semi-circles and joined by the Company's patent lock bar, while the joints between successive lengths of pipe were of the butt variety.

The two barrels are linked up with a small clearance (½-in. to 1-in.) between each by a butt strap rivetted on to each barrel by a single row of rivets. These straps are 6-in. broad, and are made in two halves; as they lie almost flush with the locking bar which prevents a complete circling of the barrel by the straps, two cover plates, covering both the locking bar and the ends of the straps, are rivetted on to complete the joint.

The standard length for pipes is 28-ft. Special expansion joints with tallow packed glands are placed at distances not exceeding 500-ft. All angles up to 5 degrees are taken up at expansion joints, and angles above this figure were made in special steel castings provided with holding down bolts. These castings were made to four patterns, viz:—10°, 15°, 20° and 25°, with expansion joints for connecting up with spigot ends of steel pipe on either side. (The bends are bolted down to large blocks of concrete varying from 10 to 80 tons according to the thrust to which they are subjected).

Air valves are fixed at the summits, and scour valves at all depressions; the former are 4-in. diameter and the latter 10-in. diameter. As stated, expansion joints are provided to take up variations due to temperature changes at lengths not exceeding 500-ft., and for this length the following are the increments for different variations in temperature:—

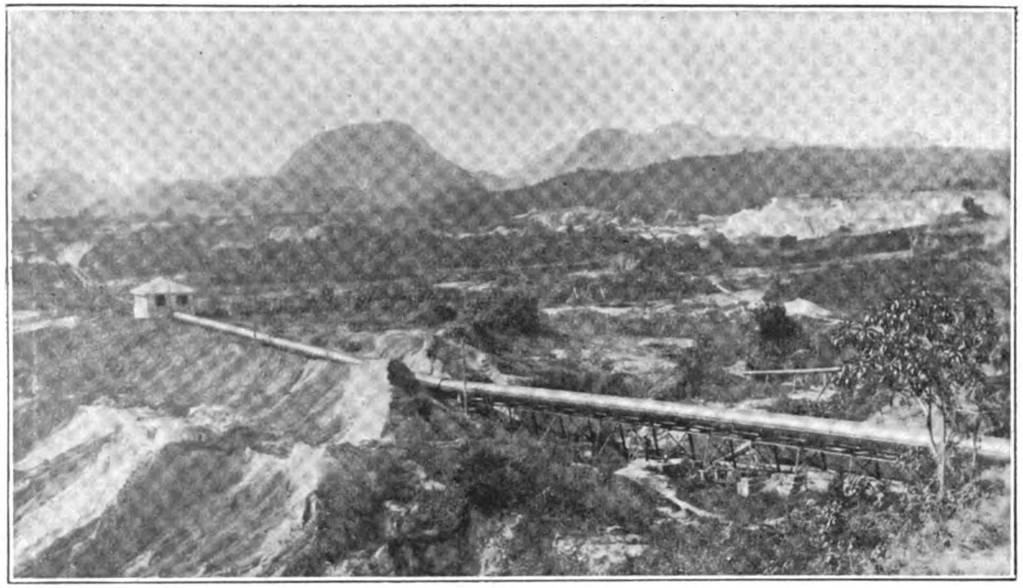
Variation in Temperature.	Variations in length.
90° Fahr.	3 5/8 inches
80° „	3 7/32 „
70° „	2 13/16 „
60° „	2 13/32 „

The following table gives the number of pipes and joints for each thickness of pipe employed.

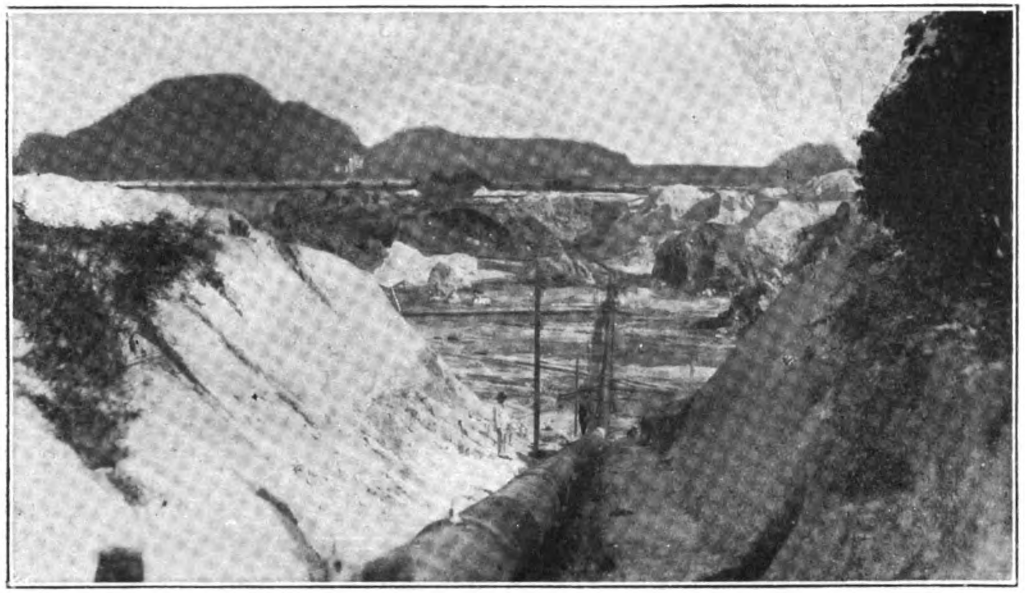
Thickness of Pipe.	Maximum Static Head.	Number of different* pipe lengths.	Nunber of Bends.	Number of Joints. Butt Strap.	Expansions on S. Pipes.	Expansions on Bends.	Total Number of Joints.
5/16 in.	419 ft.	794	20	710	48	40	798
3/8 in.	562 ft.	103	2	94	7	4	105
7/16 in.	650 ft.	599	6	558	35	12	605
Totals		1,496	28	1,362	90	56	1,508

* Not all standard length, and incıudes "closure" pipes.

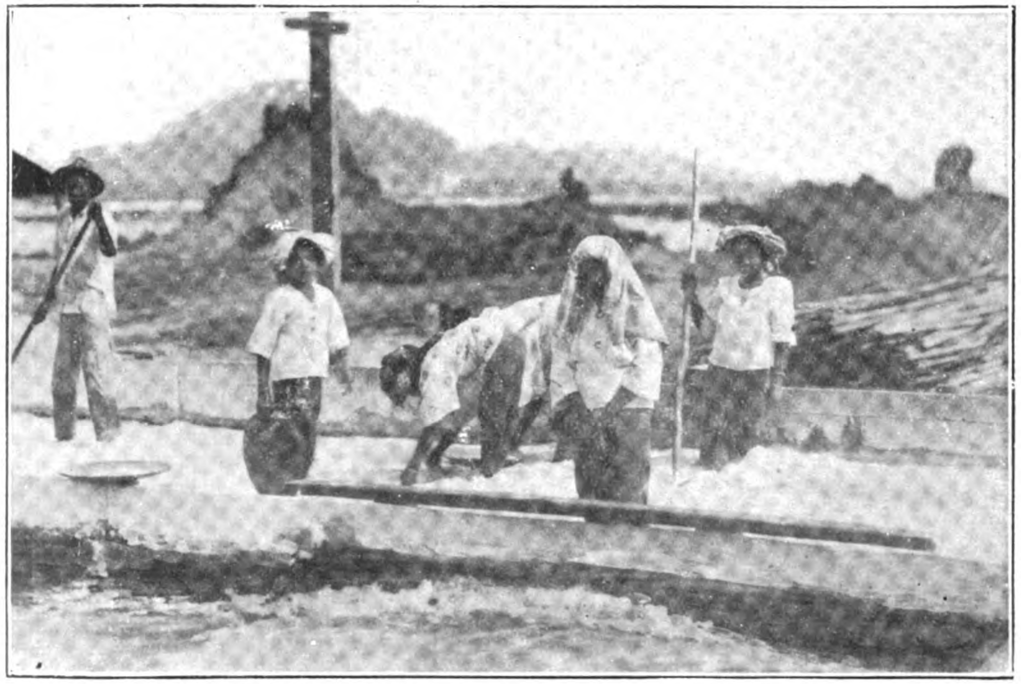
THE PIPE LINE AND WORKINGS AT GOPENG, CONSOLIDATED, F.M.S.



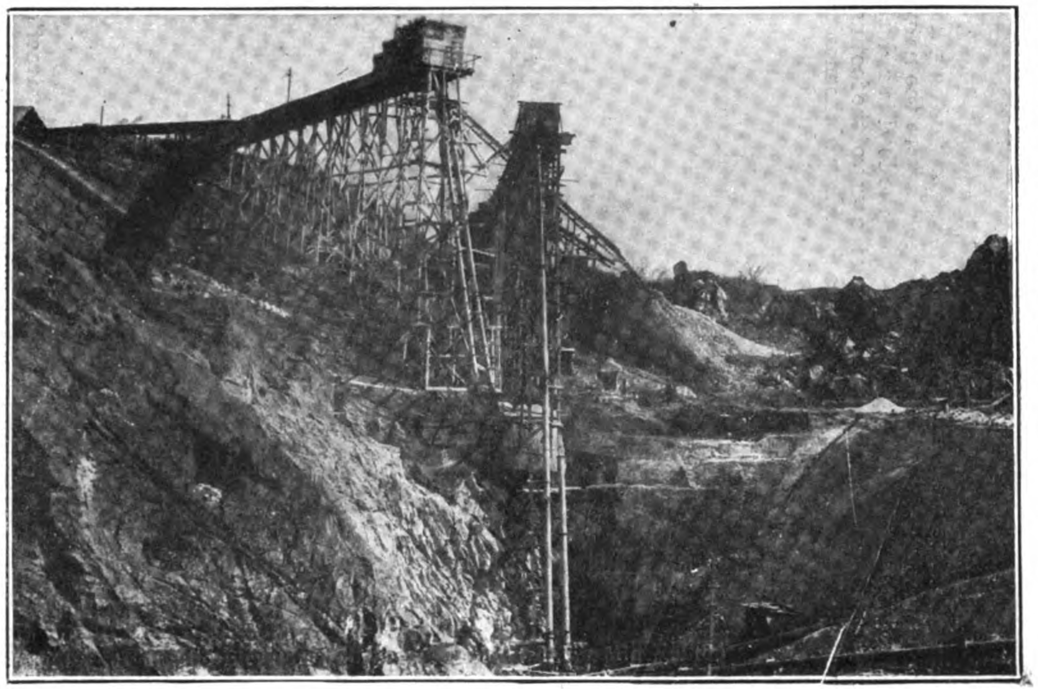
Thirty-inch Pipe Line



Forty inch Pipe Line



Malay Girls Washing Tin in Sluice Boxes at Gopeng



Hydraulic Elevators at Gopeng

Support For Pipe Line.

The pipe line is all laid above ground and is supported on concrete pillars. These are founded on rock, hard earth or on piling. Usually the spacing of piers is 28-ft. apart, but where the nature of the foundation requires it, the intensity of the load is reduced by spacing the piers 14-ft., also by increasing the area of the footings. All piling was driven till a set of ⅜-in. with a 5-ft. drop of the monkey was reached. The weight of the monkey for 8-in. by 8-in. and 6-in. by 6-in. piles was 400-lbs., and for 9-in. by 9-in. piles 1,120-lb. The piling was all of chengai or merbau wood.

It may be noted that during construction the empty rivetted pipe was left unsupported at one place for a length of 84-ft. without any springing of the caulking taking place. To carry the pipe line and tramway during construction over the Kampar River, three lattice bridges of 80-ft. and one of 55-ft. span were constructed. To bridge small ravines and uneven ground 37 lengths of trestle-work were erected. The latter varied in length from 14-ft. to 322-ft., and in height from 5-ft. to 30-ft. All bridges and trestlework are of steel.

Rivetting of Pipes.

The bottom semi-circle of rivetted joint was completed first by hand, the rivets being hammered up inside and held up from outside the pipe ; the rivets in the top semi-circle were put in from inside and hammered up on the outside of the pipe. Some of these latter rivets were hammered up with pneumatic hammer, but the majority were done by hand. The cover plates were rivetted up by hand, the hammering being done on the outside. All caulking of the butt straps and cover plates was done with the pneumatic hammer. Great difficulty was experienced in getting sufficient labour to work the pneumtic hammers, the work being too heavy for the Chinese artizans. A few joints were caulked by hand but the work was most inferior compared with that done by the pneumatic hammer.

Method of Transport.

All material from Penang was brought by rail to Kota Bharu, whence the transport of pipes to Gopeng was carried out by traction engines, and latterly by bullock wagons, the latter method proving the cheaper. All other material was transported by bullocks. On the works a tramline, 2-ft. gauge, was laid alongside of the pipes. Along three miles of this track the haulage of material was done by steam locomotives, whilst over the jungle section four miles were worked by steam winches (three in number) and a locomotive. The remaining mile towards the intake works was worked by coolie haulage. Special bogey trucks were used for the transport of pipes.

Time of Construction.

The trial surveys were completed in the year 1911, and the earthworks were cut in 1912. The first pipes were delivered in Malaya in June 1913 and the pipe line was completed in February 1915.

Geology.

Many different theories have been advanced to account for the Gopen deposits and I will not weary you with them now, but I will say that in my opinion the evidence available at the mine tends to confirm the theory propounded by Dr. W. R. Jones. This, briefly put, is as follows :—The Gopeng deposits are not true alluvial deposits but have resulted from the decomposition in situ of schists and phyllites which have subsequently subsided into very large troughs due to the solution of the underlying limestones by water percolating from above. When the neighbouring granite mass of the main range was intruded it sent off numerous small stringers carrying tin-ore into these schists and phyllites, forming a kind of stock-work.

These metamorphosed rocks have since been subjected to a long period of intense tropical weathering and have subsided into the large limestone cups mentioned above. During this process the original form of the deposit has been lost, the stringers have been broken up into angular fragments, and the tin-ore has become distributed ; the result being a deposit containing tin-ore throughout but richer near the granite junctions.

That the percolating water has been largely instrumental in decomposing the less stable minerals originally associated with the cassiterite is strongly evidenced by the frequent occurrence of an iron-oxide cap resting on the limestone. I will now pass on to the workings at the Lallang section.

Lallang Section—Main Paddock

Plant.

Three "O & C" type elevators fitted with 3-in. diameter nozzles with a pressure at the base of 170-lbs. per sq. in. The vertical lift is 76-ft. Kampar water supply—3 monitors fitted with 2-in. dia. nozzles at a pressure of 150-lb. per sq. in. Old and new Gopeng water supply—3 monitors fitted with 2-in. dia. nozzles at pressure of 60-lbs. per sq. in. The ratio of cutting water to elevator is approx : 0.7 to 1.

Feeder and Sluice Boxes.

The feeder is 156-ft. long, 10-ft. wide, and built with a gradient of 1 : 60. At the head of the feeder a " Grizzley " is employed for separating all material over ⅜-in. size. This is returned to the paddock for a second and final treatment.

Boxes.

These are 300-ft. long, with a gradient of 1 : 50 and divided into 4 boxes each 7-ft. 6-in. wide and two boxes each 10-ft. wide, giving a total width of 50 feet.

Excess Water.

Excess water is led off the feeder and discharged without passing over the material in the boxes leaving 35 cubic feet of water and material to one trasverse foot of sluice box. The tailings from this section are discharged into the Sanglop valley and held up by Sanglop Dams No. 1, 2 and 3.

Tailings Dam, etc.

Three tailings dams have been built in the Sanglop valley and one on the Serdang section. Sanglop No. 1 was built in 1914. It is 16 chains long. There are two concrete spillways, 56.5-ft. and 51-ft. wide respectively, one for general use, the other for flood water. The area impounded by this dam is 208 acres.

Sanglop No. 2 was built in 1916/17 and came into operation in August 1917. It is 31 chains long, 10-ft. wide on the top and 80-ft. wide at the base. On the upstream side the dam has a slope of 1 : 3 and on the downsteam side a slope of 1 : 2. This dam contains a puddled clay core. The overflow of the box spillway is 128-ft. long wth four outlet tunnels all 100-ft. long and 9.5-ft. wide designed to take off 100,000 cubic feet per minute. The area impounded by this dam is 239 acres.

Sanglop No. 3. The construction of this dam was commenced in August 1920 and it became operative in December 1920. There are two concrete spillways each 50-ft. wide. The dam is 18 chains long, 80-ft. wide at the base, and 10-ft. at the top. The clay core is two feet wide at the top, two feet below the surface of the dam and between 5-ft. and 6-ft. wide at the base. The slopes of the dam are 1 : 3 upstream and 1 : 2 downstream. This dam impounds an area of 165 acres. The top of the dam was built 13-ft. above the level of the slimes in August 1920.

Sludge Channels

Sanglop Channel.

From Sanglop Dam No. 2 the sludge is directed along the bed of what was formerly the Sungei Sanglop for a distance of about 4 miles until it reaches a railway bridge on the north side of Kota Bharu station. From the railway bridge to the Kinta River (a distance of 180 chains) a channel has been excavated 25-ft. wide.

Teja Sludge Channel.

From Serdang the sludge here is also directed along the old river bed for a distance of approx. 5 miles until it reaches a railway bridge on the south side of the Kota Bharu railway station. From the bridge to the junction of the Sanglop Channel and the Kinta River (a distance of 74 chains) a channel has been cut 25-ft. wide.

In order to give you some idea of the problems which these channels have solved, I will give you a brief history of the Sanglop valley during the last thirty years.

Before the original Gopeng and Kinta mines were brought into being, Asiatic miners had been dumping into the Sanglop valley for years. When the European companies began operations the scale of dumping was very materially increased not only by the Companies' own activities but also by those of the Asiatics who profited by the additional water introduced into the upper part of the valley by the pipe lines.

(Continued on page 230)

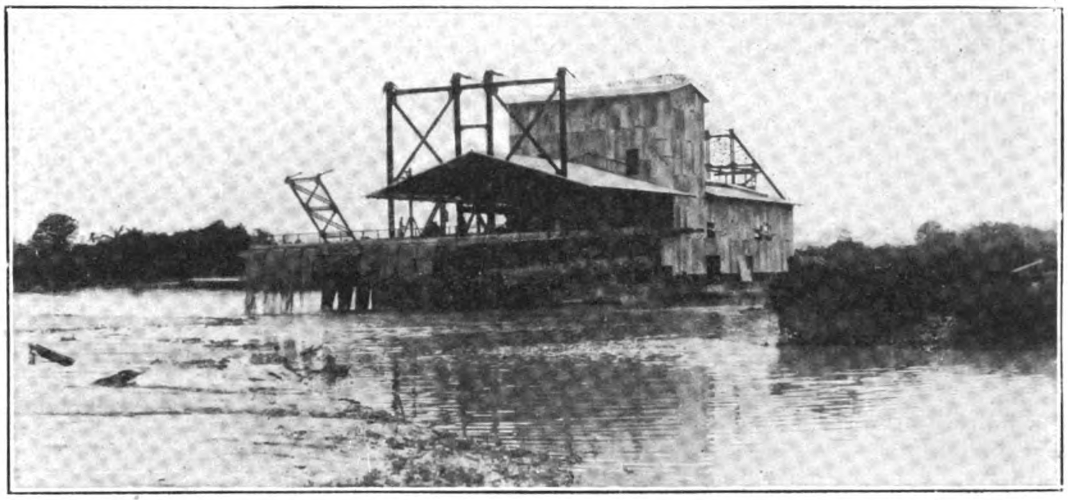
Pengkalan, Ltd., Power Station and Electric Dredge

Paper Read Before the Engineering Association of Malaya, By W.J. Wayte, M.I.E.E.

I PROPOSE as the subject of this paper to give a short description of the power plant on this property and describe any of the machines which I think may be of interest to the members of this association.

The original power plant consisted of three water-tube boilers and two triple-expansion high-speed engines and alternators, each of 500 k.w. capacity, which supplied power to drive three suction gravel pumps, and monitor pumps. The gravel pumps were erected on pontoons and worked in a dry paddock, the ground being cut by monitors.

On the outbreak of war and the collapse of the tin market, the dredges were closed down and dismantled, and the power station has since been used to supply power to neighboring mines and for the company's mining operations which have been on a small scale up to the present time.



Electrically Operated Tin Dredge at the Pengkalan Mines, F.M.S.

A bucket dredge, of which a description is given later, is now approaching completion and will be driven entirely electrically. The company has entered into an agreement with government to supply 350 k.w. for power and lighting to the township of Ipoh, and it is hoped that the work will be completed by the end of the year.

The present power plant is as follows :

Four water-tube boilers, each of 2,437 square feet heating surface, with chain grate stokers and superheaters ; the working pressure is 175-lb. per sq. in. and temperature of the superheated steam 500° F.

The coal used is "Smalls" from the Malayan Colliery Co.'s mine, which burns satisfactorily on the chain grate stokers.

One 600 k.w. turbo-generator. The turbine is of the Ratean mixed pressure type, running at 3,000 revolutions per minute, and is direct coupled to a 600 k.w. three-phase, 50 period, alternator, generating current at 2,200 volts pressure. This machine was installed in 1912.

No. 2 machine is one of the original triple-expansion engines, the other having been sold to make way for the new turbo-generator which I will now describe.

This machine was completed in November 1920, it is of 1,200 k.w. capacity and runs at 3,000 revolutions per minute. A few details of its construction may be of interest. The turbine is of the Rateau impulse multi-stage type. The first wheel is a velocity wheel with two rows of blades and the remaining six wheels each have a single row of blades.

The wheels are of solid steel turned all over ; the blades are milled from solid bars, and machined with a fork to fit astride the wheel, to which they are secured with countersunk rivets.

The diaphragms are of cast iron made in halves, the blades being cast in position.

No drop in pressure takes place except through the diaphragm blading. The clearances can therefore be large ; the axial clearance between wheels and fixed parts is about $\frac{3}{32}$-in., and the radial clearance about $\frac{1}{4}$-in.

To prevent leakage of steam at the centre of the diaphragms, glands made of soft brass are provided. These are machined to a knife edge and practically touch the rotor. The glands at the h.p. and exhaust end of the casing are of similar design and consist of steel boxes in halves. These boxes are provided with rings machined to a sharp edge which are a very close fit to a steel sleeve fitted on the rotor shaft, on which are machined other rings fitting between the box rings, and forming a labyrinth packing. The L.P. packing is always sealed with steam to prevent loss of vacuum and the H. P. end is sealed by internal pressure when the machine is on load. No lubrication is required. The governing of the machine is controlled entirely from oil pressure, and a combined stop and emergency valve comes into operation if the speed exceeds 10 per cent. above normal.

The thrust bearing is of the "Michell" type.

Washing Tin in Sluice Boxes of Tin Dredge

The alternator is of the standard turbo type and direct coupled to the turbine. It is designed for an output of 1,500 k.v.a., three phase, 50 periods, 2,200 volts.

The insulation of the stator is of mica moulded on to the former wound coils. The end connections are very strongly clamped to prevent distortion by short circuits. The exciter is of the overhung type, mounted

on the extension of the alternator shaft, and is designed for a pressure of 110 volts.

The condenser is of the surface type, 300 sq. ft. cooling surface, with Edwards air pump, and is designed to maintain a vacuum of 27½-in. at full load. The cooling water required at 90° F. inlet temperature is 2,200 gallons per minute.

On the right of the main switchboard will be noticed the new switch cubicle for controlling the supply to Ipoh.

Bucket Dredge.

The pontoon is 160-ft. long, and 43-ft. wide, 9-ft. deep aft and 8-ft. deep forward. It was built on shore and launched on slipways with the gantry posts in position.

The pontoon is provided with 14 water-tight compartments, each of which is connected to the bilge pump, mounted on the deck.

The ladder is 106-ft. long to the centre of the tumblers. It is close framed, with diagonal stays and tray plates. The ladder rollers are of cast steel with rocker chair bearers.

101 manganese steel buckets are used, of 5 cu. ft. capacity, close connected. The bucket pins are of nickel chrome steel.

The upper tumbler is of cast steel five sided, and fitted with manganese steel wearing plates.

The lower tumbler is circular and of cast steel.

The tables are divided into two banks. The top tables are divided into eight partitions each 3-9½-in. wide and 100-ft. long. The bottom tables are about 30-ft. shorter.

The total table area is approximately 5,500 square feet.

All machinery requiring speed variation is controlled from a platform on the starboard side, forward, 12-ft. above deck level.

The dredge is designed to dig 80,000 cubic yards per month at a depth of 45-ft.

The following particulars of the power equipment may be of interest:—

The dredge is connected to the transmission line on the shore by a 200 volt, three core, armoured cable, particulars of which are as follows:

The cores consist of No. 2 B & S. stranded copper, insulated with rubber tape and varnished cambric. The conductors are stranded together with jute fillers, taped, covered with a layer of tarred jute, armored with No. 12 b.w.g. galvanized steel wires, with protective braiding over the armoring.

The dimensions of the cable are:

Over protective braiding	1.85-in.
Over armor	1.4 ,,
Under armor	1.27 ,,

The slack of the cable in the dredge pond is carried by floats, and a cable winch is mounted on the dredge. This cable leads to a high-tension switch cubicle, fitted with the necessary recording instruments, which controls a bank of three single-phase transformers forming a group of 400 k.v.a. capacity. The ratio of the transformers is 2,000/400 volts.

To provide water for the upper and lower tires of tables two pumps of the centrifugal type are provided, each capable of delivering 400 gallons of water per minute against a head of 22-ft. and 15-ft. respectively. These two pumps are driven by a 75 h.p. squirrel cage motor.

The screen pump is of the same type and designed to deliver 300 gallons of water per minute against a head of 40-ft. This pump is driven by an 85 h.p. synchronous motor which I shall refer to later.

The bucket line motor is 120 h.p. and the screen 35 h.p., the motor for the ladder winch is 50 h.p. and for the mooring winch 25 h.p.

All the motors are controlled by switchgear of the iron-clad type and are fitted with no-volt and overload release. The only motor calling for special mention is the 85 h.p. motor driving the screen pressure pump. This motor is of the self-starting synchronous type and embodies some special features.

The rotor is wound with a symmetrical two-phase winding. Three slip-rings are used. the middle ring being connected through the exciter to the mid-point of the two-phase winding. The rotor current on starting passes through the exciter but when the exciter builds up the continuous current generated is superimposed on the alternating rotor current and the rotor pulls into synchronism.

The starting of the motor for a machine of this type is exceptionally simple, the motor runs up to speed quickly, taking rather less than full load current momentarily, and pulls into synchronism immediately full speed is reached. A switch is connected in one phase of the rotor which is opened after synchronism has taken place, the rotor curent being reduced from 170 to 118 amperes.

This machine has been installed with a view to correcting the station power factor and it is hoped that much benefit will be obtained from it.

Pipeline and Workings at Gopeng

(Continued from page 228)

As a natural consequence the upper Sanglop valley became gradually filled with tailings which, as little attempt was made to impound them, were moved downstream a little at a time after each rainstorm. They spread over the valley bottom and the levels rose until slimes began to invade the lower lying agricultural holdings. In 1915 Sanglop Dam No. 1 was built to retain the tailings from the Gopeng Consolidated and Kinta Tin Mines and 4,000 cubic feet of water per min. were introduced into the valley from the Kampar water supply. The Sanglop Dam No. 1 retained the new tailings but the old tailings and new tailings from Asiatic miners operating below the dam were gradually forced down the valley until they were held up by the embankment of the railway.

Various expedients were tried to deal with the situation created and in 1916 Sanglop Dam No. 1 being full, Sanglop No. 2 was constructed.

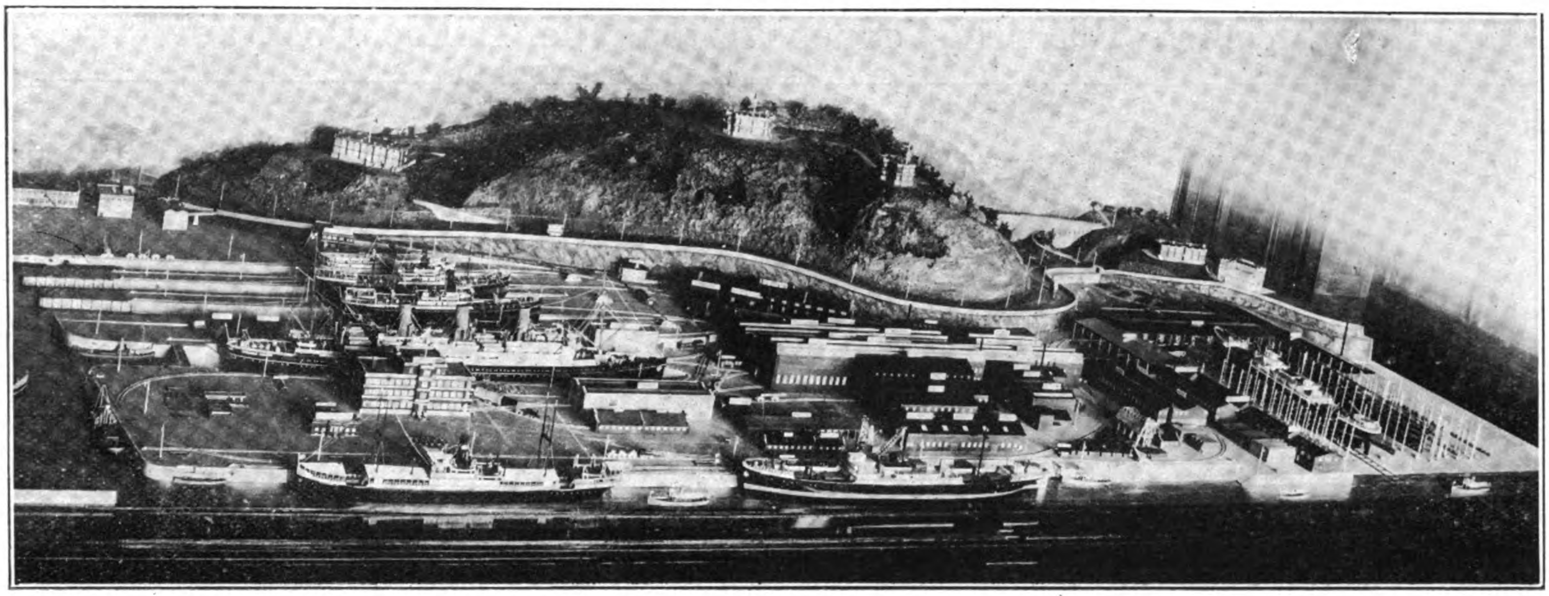
The government became apprehensive as to the safety of the railway and complaints were received from land owners of the lower part of the valley that the silt was rising and flooding their land. Early in 1917 various high government officials met Messrs. Osborne and Chappel and after discussion it was agreed that the railway should alter their bridge and culvert accommodation to deal with flood water and Messrs. Osborne and Chappel should clean and straighten the channel of the Sanglop River from the Kinta River up to the railway bridge. There was a certain amount of delay in obtaining the necessary authorisation and work was not commenced on the cleaning out of the Sanglop channel until September 1917.

Progress was at first very slow, the coolies finding it very difficult to work in the deep slimes and, for a short time, it was feared that the scheme could not be carried through. Eventually, however, the work was completed and an immediate improvement was noticed. Surveys had showed a grade of 4¾-ft. per mile to be available over the 2¼ miles of channel, giving a mean flow of 3.35 feet per sec. *i.e.* enough to carry off a considerable amount of solids in suspension. A channel 15-ft. wide, following the old river bed as far as possible, but straightening out all prominent bends and curves was put through and later widened out to a size experience showed to be necessary after a scour had been induced.

By early 1918 the stream had been forced into a defined channel and the surface of the water in dry weather was well below the level of the silt floor of the valley. Conditions since then have steadily improved and to-day we have a well defined channel from the outlet of Sanglop Dam No. 2 to the Kinta River, which careful records and surveys made during the last nine months have proved can carry well over 2,000 grains of slimes to the gallon without silting the channel.

Saw Mill for Changchun

The Yalu Timber Company is planning the erection of a new mill of considerable capacity at Changchun which will extend its service zone almost 100 miles westward of the Kirin district where it put a branch mill in operation some time ago. The timber company, which is capitalised for $3,000,000, is a Sino-Japanese organisation, is the outgrowth of the timber industry started in 1904 by Baron Okura at Yongampho on the Korean side of the Yalu. The area of timberland held under concession by the company is said to contain more than 3,500 million cubic feet of lumber, beside which the company has the exclusive right to purchase and market logs cut by the natives from lands adjacent to its concession area. The company's main mill is located at Antung.



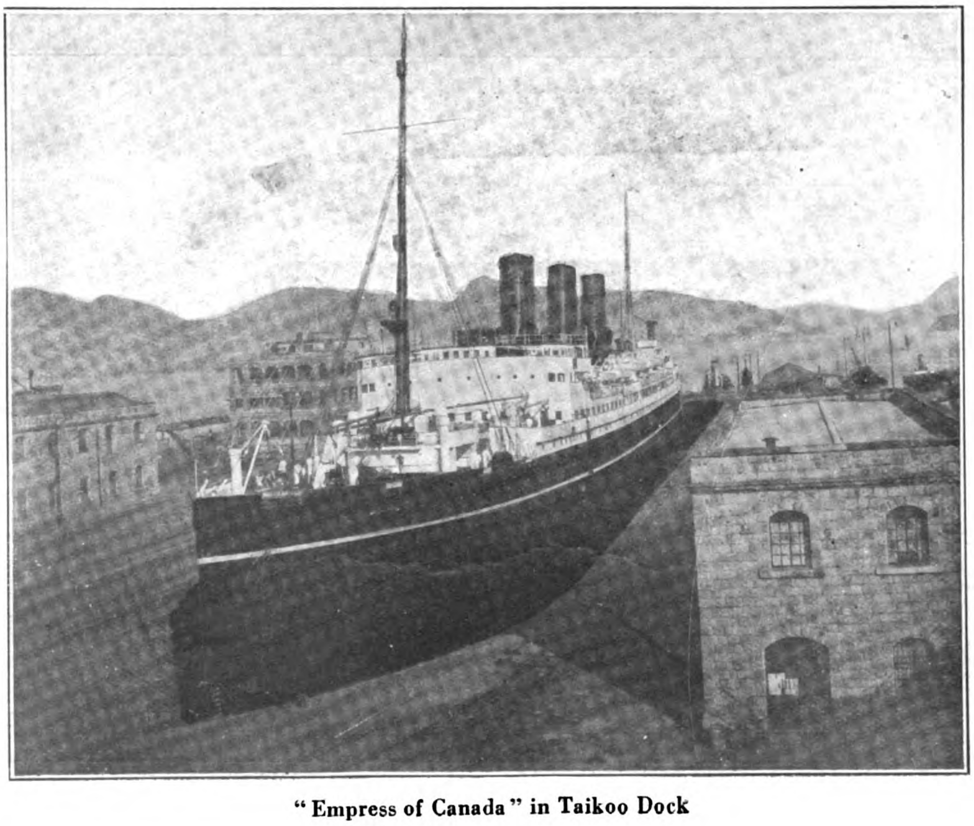
Model of Taikoo Dockyard made for the British Empire Exhibition.

Hongkong's Contribution to the Empire

Taikoo and the Hongkong & Whampoa Docks

ONE of the most interesting exhibits of the Hongkong section at the British empire exhibition is that of the Taikoo Dockyard and Engineering Company of Hongkong, Ltd., which prepared an exact facsimile of the entire dockyard made carefully to scale showing in detail every building, slipway and road on the company's property. This model was executed at the company's works and occupies a prominent place in the exhibits of the colony, giving the visitor to the Wembley exhibition a lively visual idea of the magnitude of the dockyard with its quay wall 3,200 feet in length. Two ocean-going steamers and several other craft moored alongside the quay wall in the model testify to the varied activities of the dock in the repair and building of ships.

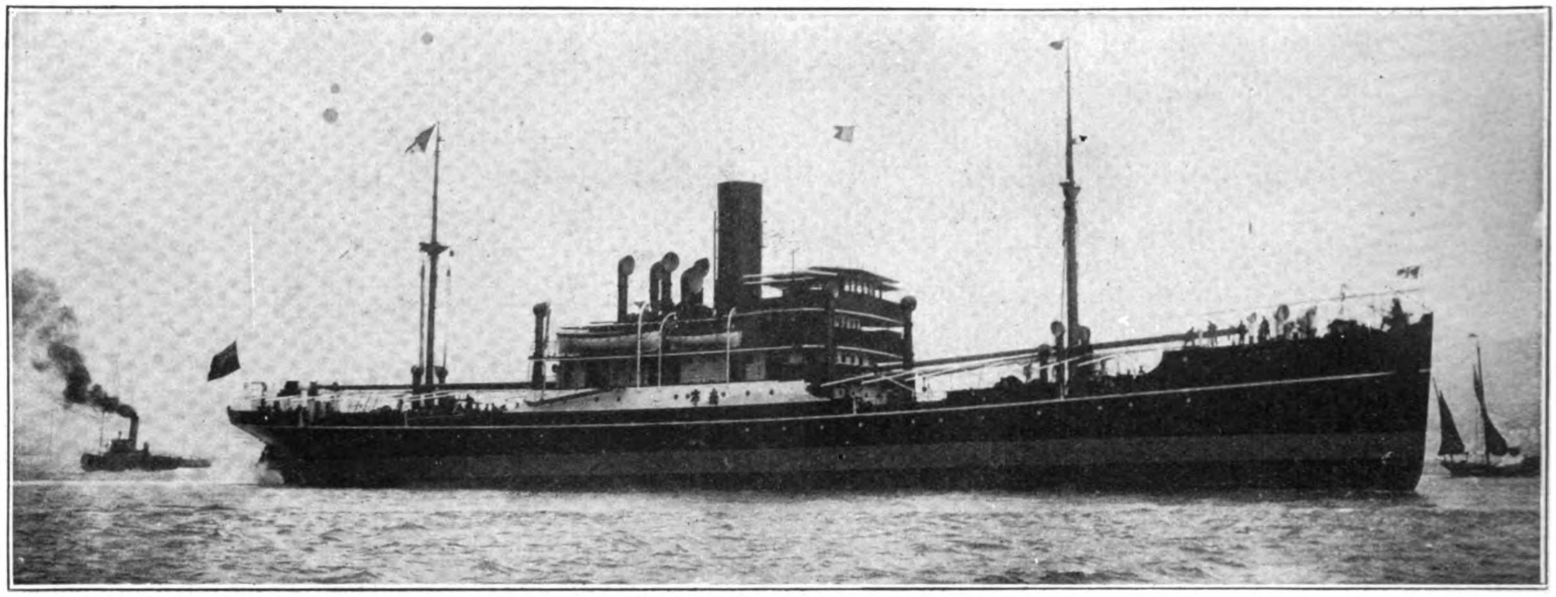
Advantage was taken by the dock to include in the model the Canadian Pacific liner *Empress of Canada* as it lay in the drydock in a recent overhauling given the vessel in Hongkong. In the small model, the liner is seen directly behind the administration building. A separate illustration shows the *Empress of Canada* after the dock had been pumped out. This dock, one of the largest in the Orient, was constructed to British admiralty requirements and is 787 feet long by 81 feet 10 inches wide at the bottom. The total length on the blocks is 750 feet.



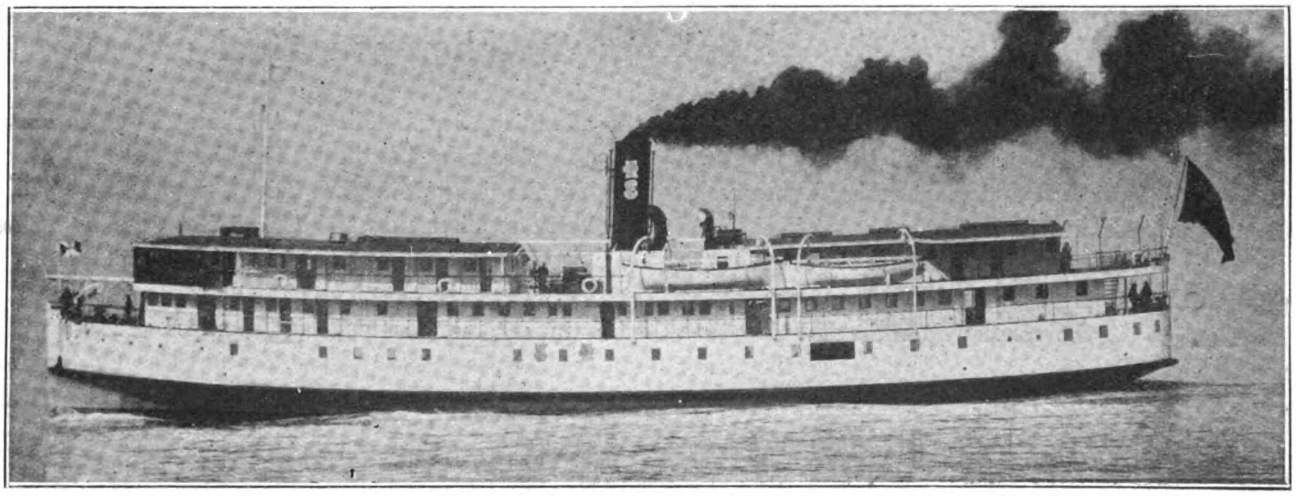
"Empress of Canada" in Taikoo Dock

This dock is extremely rapid in operation as it can be filled in 45 minutes and its pumps have a capacity for emptying it, even with no ship on the blocks, in less than four hours. The depth of water to be handled is 34 feet 6 inches. The dock is equipped with railway tracks on both sides to carry the traveling cranes which have a capacity up to 20 tons. Aside from the big dock, the yard has three slipways capable of handling steamers up to 3,000 tons which can be hauled up the ways in 45 minutes. The motive power for the dockyard consists of 3,000 horse-power gas engines driving electrical generators, and taking their power from four gas producers.

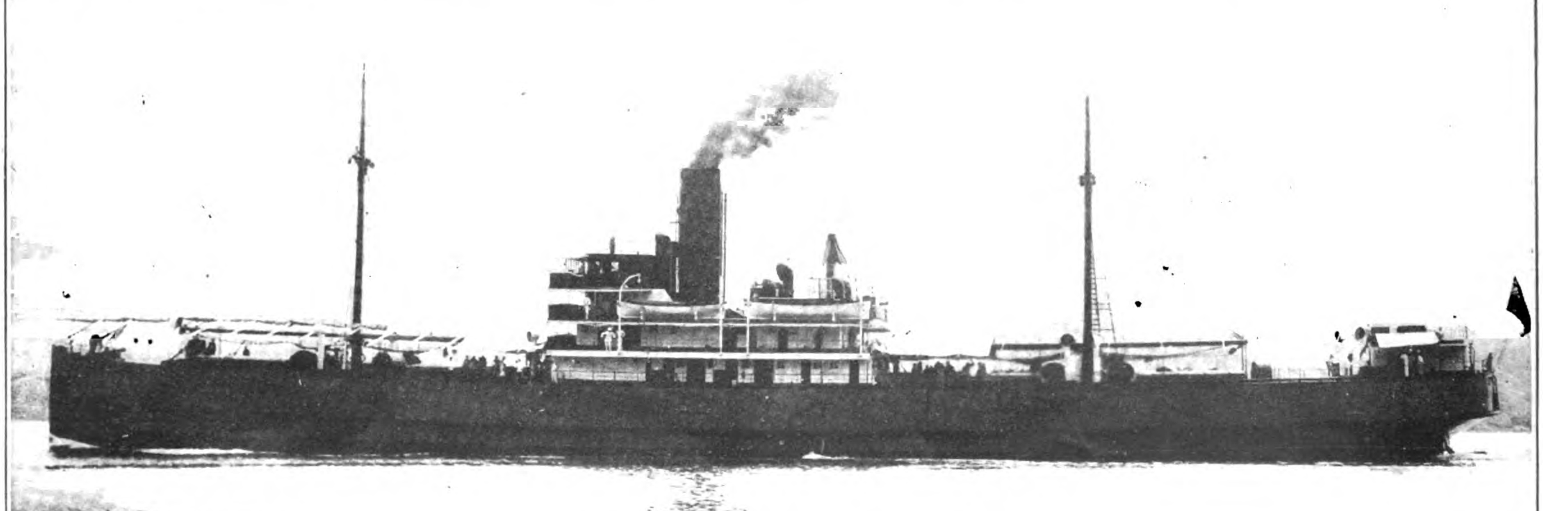
New Steamers Recently Launched from the Taikoo Dockyard



S.S. "Nanning," Built at Taikoo Dockyard



River Steamer "Hang Cheong"

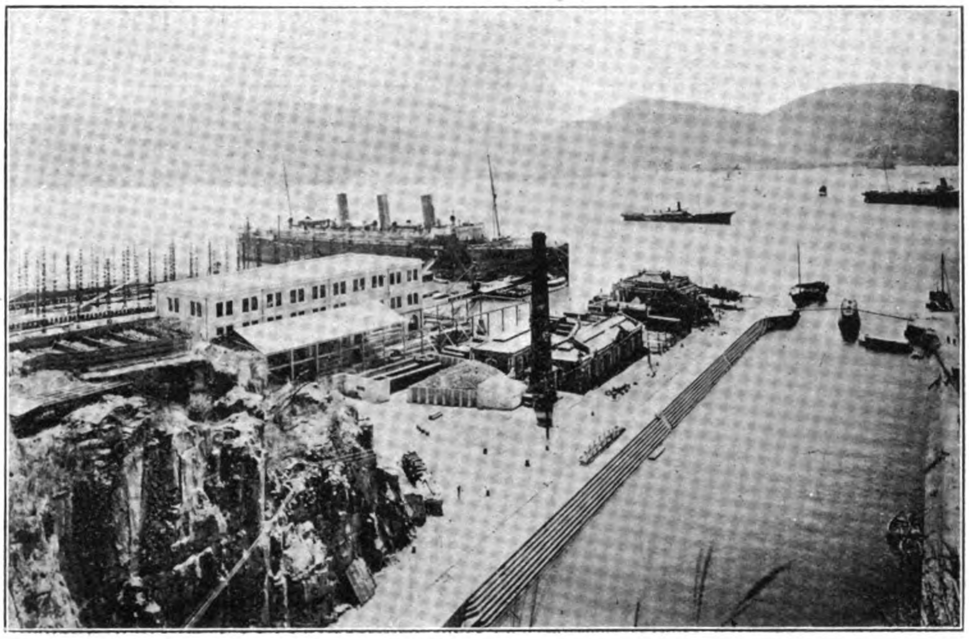


Yangtsze River Steamer "Wenchow"

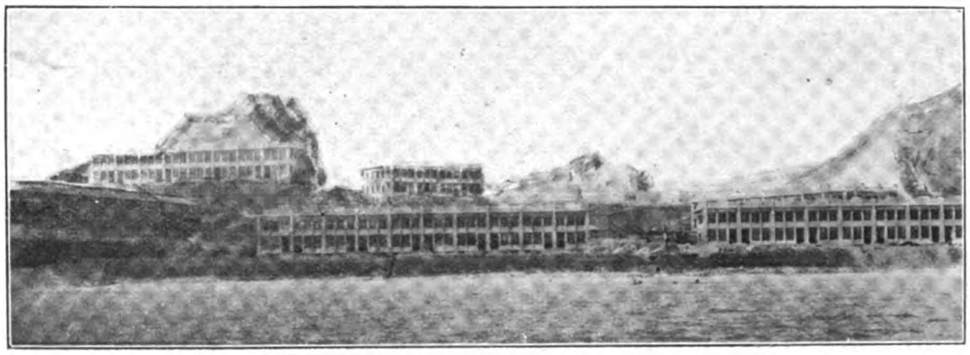
The Growth of a Great Shipbuilding Industry

The Hongkong and Whampoa Dock Co., Ltd.

BEFORE Hongkong became a British colony, there were mud docks at Whampoa in the Canton River. They were owned by Chinese, and the P. & O. Co., not caring to entrust the docking and repairing of their coast steamers to Chinese without European supervision, sent Mr. John Couper (then a carpenter in their service) to Whampoa as their representative to look after interests when their vessels went into dock. Mr. Couper speedily realized the requirements of the shipping trade, and set about a plan of campaign which brought immense prosperity to the colony. The docking business was a lucrative one, so his first step was to lease the Whampoa Mud Docks from their Chinese owners. Out of his large profits he built the Couper Dock at Whampoa, and was conducting a prosperous business when the "Arrow" lorcha affair brought about war between Great Britain and China, and involved the Whampoa Docks in temporary eclipse. The Chinese set about the destruction of the Couper Dock, which was built of granite. The stones on some of the side altars were torn asunder and cast down into the bottom of the dock, and the machinery and working plant more or less destroyed by the Chinese troops. Mr. Couper himself was kidnapped, and his fate was never known. Peace and indemnities followed, and Mr. Couper's son was awarded about $120,000 as compensation. The dock was pumped out, and the Chinese who had been so eager to destroy were employed to replace the granite masonry. In about two or three months, all the masonry had been relaid, and the docking establishment was soon under way again.



No. 1 Dock, Saw Mill and New Building Berths



Staff Quarters at Kowloon

On July 1, 1863, the present designation of this Company was assumed. Under a deed of settlement, Mr. (later Sir) Thomas Sutherland, then agent for the P. & O. Co. in Hongkong, was appointed chairman, and Mr. Douglas Lapraik of the Douglas Steamship Co., secretary. They took over the Couper Dock and the Lockson Dock at Whampoa from Mr. J. C. Couper on behalf of the company for the sum of $140,000, and the stock of these establishments for about $35,000.

In 1865, the company concluded negotiations with Mr. John Lamont for the purchase of his property at Aberdeen, comprising the Lamont Dock then in working order, and the Hope Dock then in course of construction, together with the workshops, machines, etc.

On October 11, 1866, the Hongkong and Whampoa Dock Co., Ltd., was registered under the companies ordinance, to take over the affairs of the original company with a share capital of $750,000, and Mr. James Whittall of Messrs. Jardine, Matheson & Co., was the first chairman.

The Hope Dock was opened in June, 1867, by the then governor of Hongkong, Sir R. G. MacDonnell, and for a number of years was largely used for docking ships of her majesty's navy and other large vessels.

In March, 1870, an amalgamation was made with the Union Dock Co. which possessed the property at Kowloon on which the present Nos. 2 and 3 docks are situated, and the capital of the company was increased to $1,000,000.

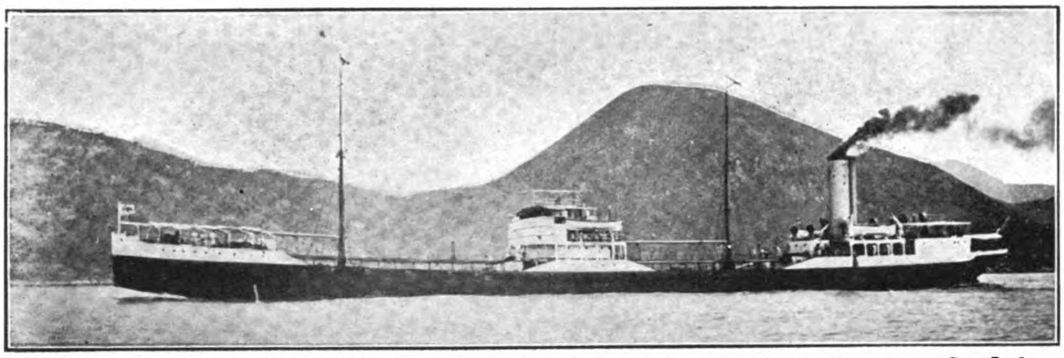
Mr. David Gillies was appointed secretary and manager in November, 1875.

In January, 1877, the properties at Whampoa, not being found to be remunerative, were sold to the Chinese government on the condition that no vessel of any other nationality than Chinese should be docked there.

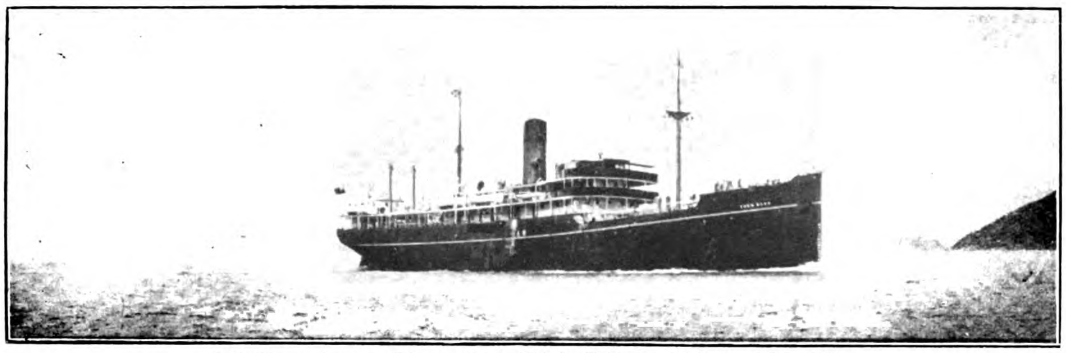
The two patent slips belonging to Captain Sands were purchased in August, 1877, for $150,000, and were subsequently removed to Kowloon Docks where they are still doing good work.

In December, 1880, the company purchased from the Cosmopolitan Dock Co. the whole of the property, plant, etc., including the goodwill of that company for $400,000, the stock-in-trade and steam launches being taken over at a valuation. The capital of the Dock Company was then raised to $1,250,000. In the same year a difficulty arose owing to low tides in placing H.M.S. *Audacious* in the Hope Dock, and as the British admiralty were contemplating the necessity of sending out a larger class of vessel to the China station, the commander-in-chief, Admiral Willes, was instructed to see what could be done to provide increased facilities for docking the largest vessels of her majesty's

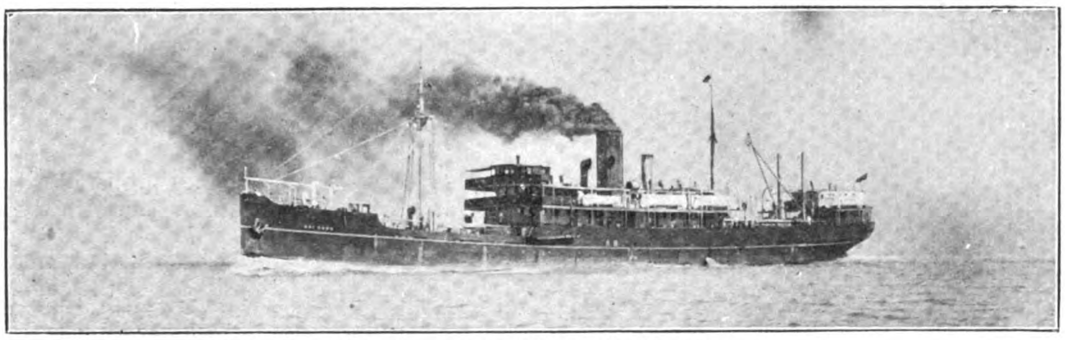
Some Recent Steamships Built by Hongkong & Whampoa Dock Co., Ltd.



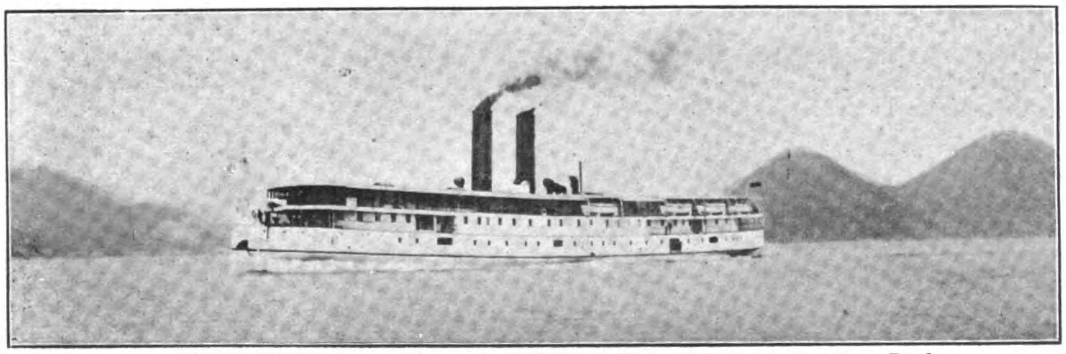
S.S. *Paludina*, One of Four Oil Tankers Built to the Order of the Anglo-Saxon Petroleum Co., Ltd. Dimensions 412-ft. by 53-ft. 1-in. by 31-ft. Mld.



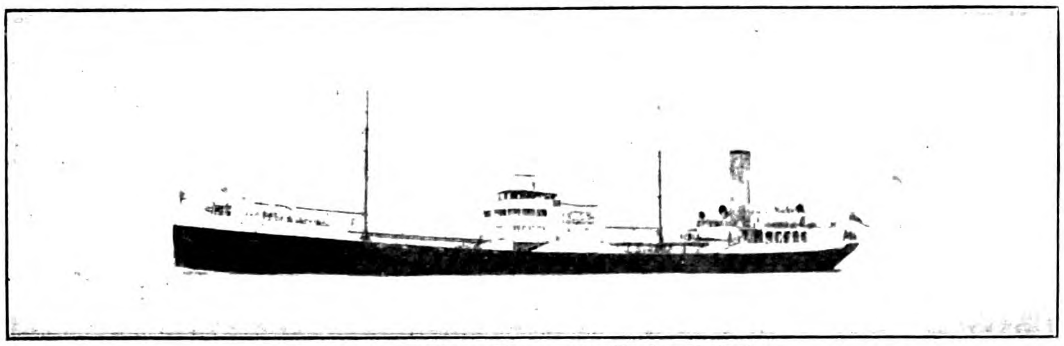
S.S. *Yuen Sang*. Dimensions 310-ft. B.P. by 46-ft. by 25-ft. Mld.



S.S. *Suisang*, Sister Ship to the *Yuen Sang*.



River Steamer *Lungshan*. Dimensions 290-ft. B.P. by 45-ft. by 13-ft. 6-in at Deck.



S.S. *Planorbis*, Sister Ship to the Tanker *Paludina*.

navy. The result was that in 1882, construction of the present No. 1 dock at Kowloon was started and was completed in 1888. It cost over $1,000,000 of which £25,000 was granted by the British government in return for priority of entrance for 20 years. It was considered at that time, second to none in any part of the world for design, finish and facilities for docking.

In 1886 the capital of the company was increased to $1,562,500 divided into 12,500 shares of $125 each fully paid. The capital of the company was again raised in 1901 to $2,500,000, divided into 50,000 shares of $50 each fully paid.

The retirement of Mr. David Gillies took place in 1901 after 26 years of splendid service, during which period he was very largely instrumental in successfully piloting the company through very difficult times to the highly prosperous condition it was in on his retirement. His successor, Mr. W. Dixon, held the post for three years, followed by Mr. Wilson and Mr. Robert Mitchell who acted as chief manager until the former retired in 1909.

The present chief manager—Mr. R. M. Dyer, B.SC., M.I.N.A., took charge of the company's affairs after the retirement of Mr. Wilson, and it is from this period to the present time that a very progressive policy was introduced and maintained, bringing the company into the first rank of shipbuilding, engineering and repairing establishments to be found in any part of the world.

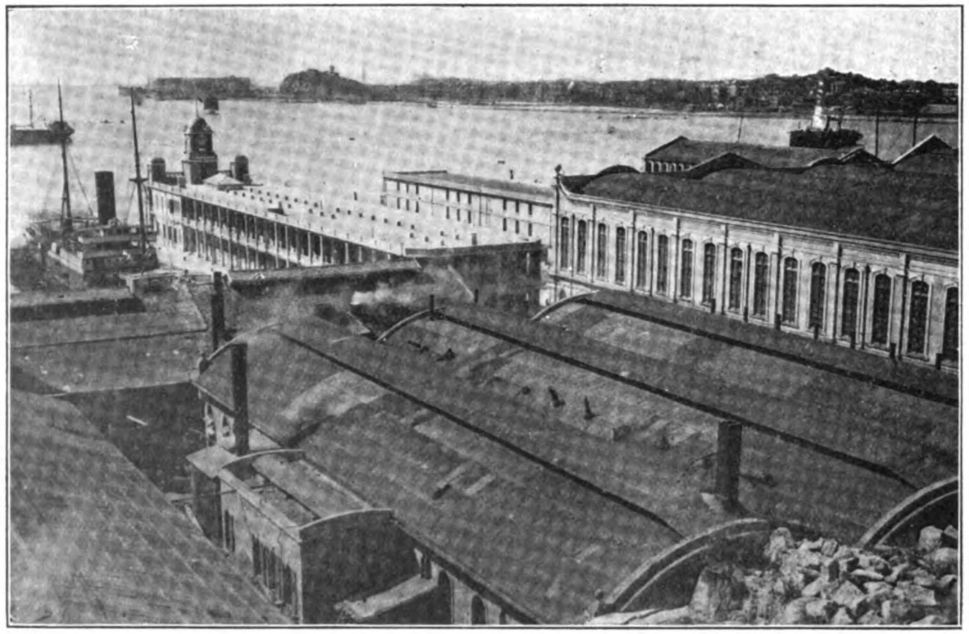
In 1915 the capital was increased to $3,000,000 by the issue of 50,000 shares of $10 each, and at the same time, debentures of 6 per cent. were issued to the extent of $1,000,000.

In common with many other places in the empire, Hongkong was given its greatest task during the period of the war. It was then that this establishment was able to show what really could be done in the way of shipbuilding, engineering, converting, reconditioning and repairing.

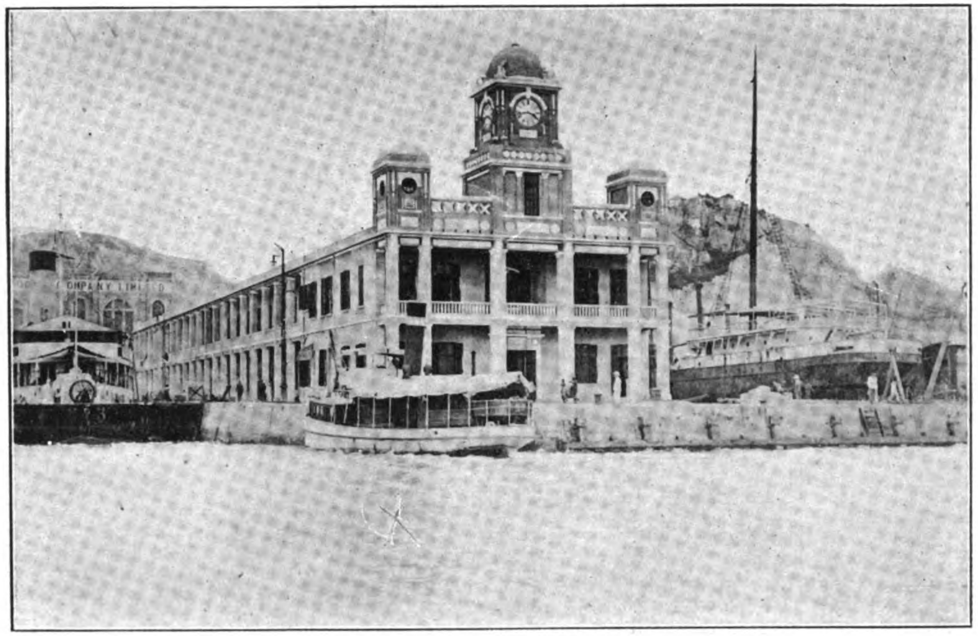
From this date onwards the business of the company considerably increased. New land was purchased from the government, and three building berths were put down, and a new shipbuilding yard built on the east of the old yard. The plant was extensively overhauled, and at the present time, the yard is complete with all modern shipbuilding machines, the company being capable of turning out steamers of 800-ft. and over. It was from this yard that three of four large oil tankers (each 8,400 tons) were launched in 1921, these being to the order of the Anglo-Saxon Petroleum Co., Ltd. A year or two previous to this, the west yard was fully employed, and as many as eight ships, side by side, could be seen under various stages of construction.

The policy of progress and expansion is fully evident at this present moment, when the company is spend-

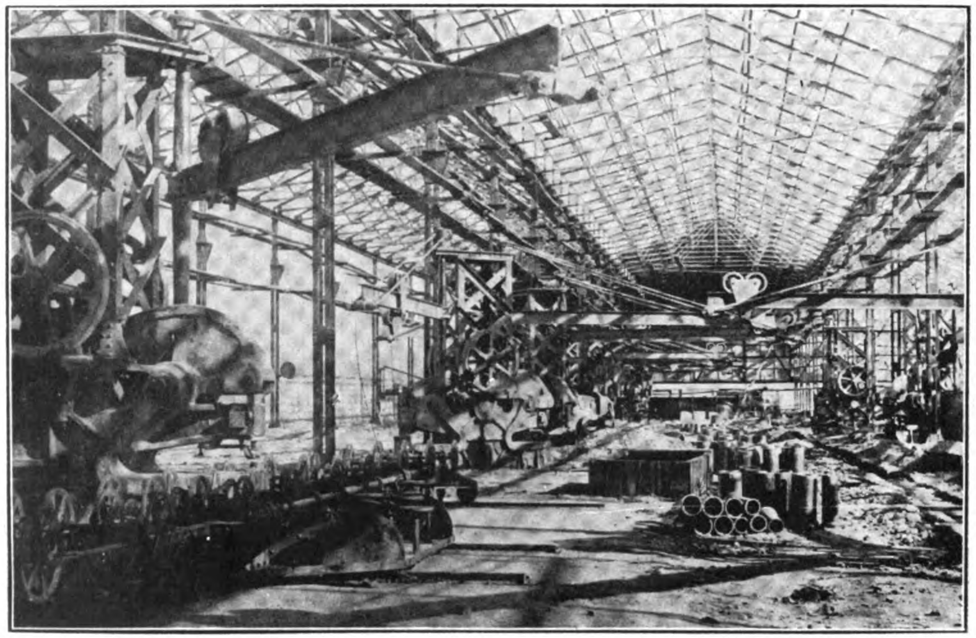
WORKS OF THE HONGKONG & WHAMPOA DOCK COMPANY, LIMITED, AT KOWLOON



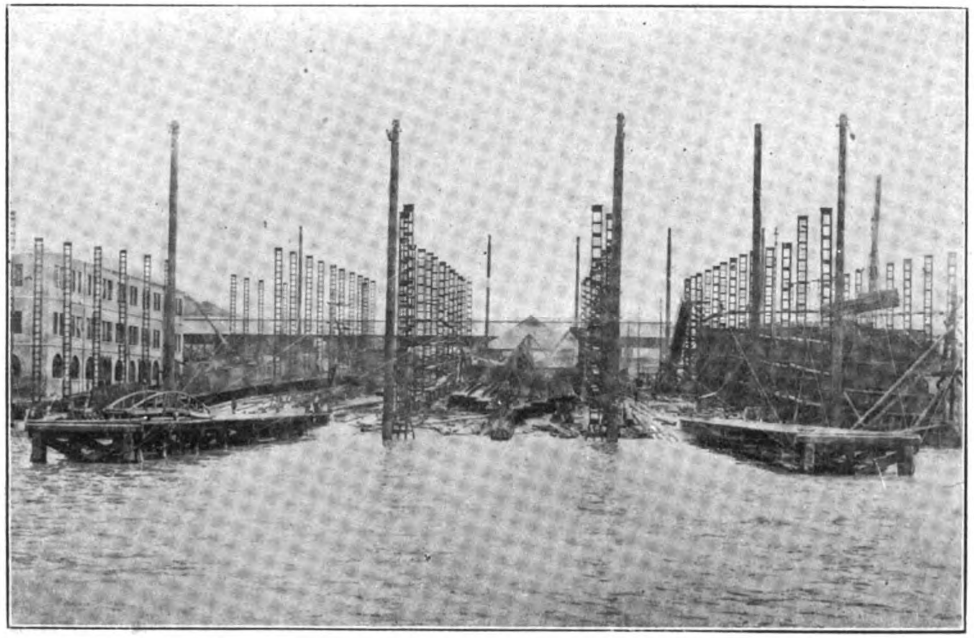
Roofs of Blacksmith's Shop, Engine Shop, New Offices and Stores



Head Office—Kowloon Docks



Plater's Shed—East Yard



Building Berths—East Yard

ing no less a sum than $ 5,000,000 in extending its properties and preparing them for the future. The present No. 1 dock, which is 700 feet long by 86 feet wide, is already too small to cope fully with every demand. The company therefore, are completing arrangments for the construction of a new dock, whose dimensions 1,200-ft. by 120-ft. will fill every requirement for many years to come.

The head office is situated at Kowloon Docks, 15 minutes by launch from Hongkong. The town office is in Queen's Buildings, Hongkong.

The following is a brief description of the docks, slipways and workshops at Kowloon Docks :—

New Graving Dock :—

Proposed length inside 1,200-ft. divided into two docks by a sliding caisson, giving length to outer dock 470-ft. and inner dock 710-ft.

Length from floorhead to inside of caisson ..	1,200-ft. 0-in.
„ of inner portion from „ „ ..	710 „ 0 „
„ of outer portion from „ „ ..	470 „ 0 „
Breadth of entrance at coping	120 „ 0 „
„ „ at sill level	120 „ 0 „
„ of dock at coping	158 „ 0 „
„ of dock at level of top of keel locks ..	121 „ 0 „
Depth of water over sill (O.H.W.) ordinary spring tides	45 „ 6 „
Depth of water over sill (O.L.W.) ordinary spring tides	37 „ 6 „
Depth of water over sill at mean sea level (*i.e.*, 4-ft. above admiralty datum) ..	40 „ 0 „
Height of keel blocks over sill	Level with sill.

No. 1 Dock :—

Length from floorhead to bilge of caisson (outerstop)	700-ft. 0-in.
caisson (innerstop)	688 „ 0 „
Breadth of entrance at coping	86 „ 0 „
Breadth of dock coping	127 „ 0 „
Breadth of dock-pillar to pillar	70 „ 0 „
Depth of water over sill (O.H.W.)	29 „ 0 „
„ „ „ (O.L.W.)	22 „ 0 „
Height of first block over sill	12 „

No. 2 Dock :—

Length from floorhead to bilge of caisson ..	371-ft. 0-in.
Breadth of entrance at coping	63 „ 0 „
Breadth of dock coping	90 „ 0 „
„ „ pillar to pillar in line with top of keel blocks	55 „ 0 „
Depth of water over sill (O.H.W.)	17 „ 10 „
„ „ (O.L.W.)	10 „ 10 „
Height of block over sill	2 „ 5 „

No. 3 Dock :—

Length from floorhead to bilge of caisson ..	264-ft. 0-in.
Breadth of entrance at coping	48 „ 0 „
Breadth of dock coping	61 „ 6 „
Breadth of dock pillar to pillar across top of keel blocks	38 „ 4 „
Depth of water over sill (O.H.W.	13 „ 6 „
„ „ (O.L.W.)	6 „ 6 „
Height of first block over sill	Level with sill.

No. 1 Slipway :—

Length of slipway	650-ft. 0-in.
Breadth „	56 „ 0 „
Declivity „	9/16″ per foot
Extreme length of cradle	238-ft. 6-in.
Length of blocks	238 „ 6 „
Declivity „	11/32″ per foot
Water on blocks at fore end (highest) ..	11-ft. 6-in.
Water on blocks at fore end (lowest)	4 „ 6 „
Maximum load—1,400 tons.	

No. 2 Slipway :—

Length of slipway	525-ft. 0-in.
Breadth „	46 „ 0 „
Declivity „	9/16″ per foot
Extreme length of cradle	200-ft. 0-in.
Length of blocks	200 „ 0 „
Declivity „	9/32″ per foot
Water on blocks at fore-end (highest)	9-ft. 6-in.
„ „ „ (lowest)	2 „ 6 „
Maximum load	900 tons

Sheerlegs :—

Test load	100 tons
Working load	80 „
Maximum overhang	23-ft. 0-in.
Steam driven.	
Depth of water at low tide	18-ft. 0-in.

Cantilever Crane :—

Lifting capacity	10 tons
Depth of water at low tide	16-ft. 0-in.
Electrically operated	

An ample number of buoys with sound moorings are in place opposite the works, where vessels of all sizes can remain safely moored.

The company has under contemplation, the erection of a 200-ton crane, on a site near the present sheerlegs. The Sheerlegs will be removed to the west yard. A sheerlegs capable of lifting 10 tons occupies a position at the entrance to No. 2 dock.

Electric Capstans.—Nos. 1 and 2 docks have electric capstans of three and five tons pull, the 5 ton being fitted with Williams, Janney hydraulic reduction gear.

Nos. 1 and New Dock Pump House.—The entire chamber is built of concrete, the floor of the suction chamber being at a level 62-ft. below the cope level of the dock with connecting culverts from the No. 1 and New Docks. The pumps are placed directly above the suction chamber, and the floor of the pump is 34-ft. below the cope level. The chamber is equipped with five 42-in. twin parallel type centrifugal main pumps, each driven by a 550 h.p. slipring motor operating on a 2,200 volt, 3 phase 60 cycle circuit. These will be capable of emptying the proposed new dock in 3½ hours. In addition, the chamber is equipped with two 12-in. drainage pumps, each capable of delivering 3,000 gallons of water per minute, and each driven by an 84 h.p. squirrel cage motor, also one fire pump set consisting of a 6-in. branch 2 stage turbine pressure pump, capable of delivering 450 galls. per minute against a pressure of 100-lbs. driven by a 55 h.p. squirrel cage motor operating on a 2,200 volt 3 phase 60 cycle circuit, and one 100 k.w. motor generator set for ships temporary lighting at any voltage from 60 to 220.

Nos. 2 and 3 Dock Pumping Plant.—The pump house is equipped with three 20-in. centrifugal pumps, driven by three h.t. slipring motors, capable of eveloping 85 h.p. on a 2,200 volt, 3 phase 60 cycle circuit. The three pumps running simultaneously are capable of emptying No. 2 dock containing approximately 12,230 tons of water in 1 hour and 20 minutes. There are also two 6-in. centrifugal drain pumps driven by 440 volt 3 phase squirrel cage motors, and one fire pump as in No. 1 dock pump chamber, and one charging set for priming main pumps.

The dockyard at Hunghom, Kowloon, consists of two separate building yards. On the west side, the yard contains seven concrete building berths, suitable for ships of the following lengths :

1—630-ft.	3—420-ft.
1—500-ft.	2—120-ft.

each berth being equipped with aerial ropeways cable of dealing with weights up to 4 tons. In the east yard, there are 3 concrete Building berths suitable for ships up to 800-ft. long by 80-ft. beam. Each berth is equipped with 3 or 5 aerial ropeways, capable of dealing with weights up to 4 tons. Electric winches, fitted with hoisting and transporting gear are placed under each ropeway at upper end of berth. Jib derricks are placed at convenient positions on each side of ship under construction. Electric winches are provided at base of derricks capable of lifting 3 tons. Both yards are fully equipped with electrically driven machines for building the largest vessels, the machines being placed in platers shed running across the heads of the shipbuilding berths.

The power house in the west yard is equipped with three 350 kilowatt, 6 phase rotary converters, converting through suitable transformers from an h.t. bulk supply of 2,200 volts 3 phase 60 cycles to 250 volts d.c. These supply the necessary motors and lighting throughout this yard, while the east yard power house is supplied by alternating current, 2,200 volts 2 phase 60 cycles transformed to 220 volts 2 phase for power and 100 volts for lighting.

The platers shed in the east yard is 420-ft. by 120-ft. divided into 3 bays. This shed is fitted up to date with all the latest machinery for punching heavy material. Three overhead electric cranes are installed for lifting material to machines as required, the heavy machinery consisting of a Doxford patent joggling machine, Lambie hydraulic press, Smith Bros. plate bending roll, two scalping machines and two plate edge planing machines, one plate

mangle, angle cutting machine and bar straighteners, four countersinking machines, 8 Bennie punching machines of heavy type, one Lysholm punching table, two friction saws, one cold saw for cutting angles cold, one rivet cutting machine, and a Smith Bros. large hydraulic plate flanging machine.

Adjoining the platers shed in the east yard is the bending shed—60-ft. by 50-ft., which has a furnace capable of taking in angles up to 60-ft. long. Scriven's frame bevelling machine and smith's hydraulic jacks are used for frame setting and bending.

A similar platers and bending shed is situated near the building berths in the west yard.

Hydraulic plant is fitted throughout each yard for both rivetting on ground and on ship, while compressed air plant is used for drilling, caulking and rivetting, and for driving auxiliary plant. Two 23 by 16 by 13 motor driven two stage intercooled air compressors are installed, one in the east end of shipyard, and one in the west end, both situated centrally for the distribution of air pressure at 100-lbs. per sq. inch. A 6-in. main is led from air compressor around the yard with 4-in. and 2-in. subsidiary branches led to each building berth, engine shop, boiler shop, foundry and smithy, and also to each slip and dry dock. The main pipe line is so arranged that the two compressors can run connected together or separately. Tools available for issue to workmen include: rivetting hammers, caulking hammers, drilling machines (rock, corner and vertical). Holding up hammers are also available suitable for all classes of work. Twist drills, reamers, chipping and caulking chisels and tools of every description are housed in a lareg store, fitted up specially for pneumatic tools, wherein a special system of checking issues and returns is carried out, and a record of all breakages and spares kept.

The method of distributing hydraulic plant pressure is similar to that of compressed air. A 3-in. main is carried around the shipyard, with branches taken to each department. Hydraulic presses in boiler shop for flanging boiler plates are supplied in this way, and all manholes, lumber holes, joggling and flanging required for plates and angles bars are done by this method by machinery distributed in the platers shed and boiler shop. Power is supplied by two motor driven hydraulic pumps operated automatically by rise and fall of the accumulator requiring little or no attention by attendant. These pumps were supplied by Messrs. Fullerton, Hogart and Barclay of Paisley, and give every satisfaction. One pump is situated in the west yard and one in the east, and generates a pressure of 1,000 per sq. inch continually. Keels, centre girders, floors, frames and stern bars are worked by this method, and in the boiler shop, boiler shells furnaces and combustion chambers are rivetted by hydraulic pressure, which ensures efficient and good workmanship in all cases.

Machine and Erecting Shop.—This building consists of 4 bays—375 ft. by 80-ft. by 75-ft. In the east bay are lathes—30-in. centre, 70-ft. between heads, 30-in. centre, 30-ft. between heads and 6-ft. centre by 30-ft. between heads for crank shafts, and various smaller lathes and planing machines, the largest of which is capable of taking work 8-ft. by 8-ft. by 20-ft. travel, and other smaller planers down 3-ft. by 4-ft. by 8-ft. travel. There are also several horizontal boring and tapping machines, the largest of which can bore tap to 3½-in. dia. and two cranes electrically driven, capable of lifting up to 50 tons. All machinery in this bay is electrically driven, each machine having its own motor.

East Centre Bay is principally used for erecting engines. Two electrically-driven cranes are situated in this bay, one of 50 tons and one of 15 tons lifting capacity.

West Centre Bay in which are housed various makes of small high speed, screw cutting and surfacing lathes, high speed radial drilling machines, milling machines of various makes and condenser ferrule making machines, turret lathes and stud making machines and one planing and slotting machine combined (planing 20-ft.—slotting 16-ft.), catalogued as horizontal and vertical planer. All machinery in this bay is also electrically driven,—the overhead electrically driven crane having a lifting capacity of 10 tons.

West Bay in which are housed various screw cutting and surfacing lathes of 20-in. to 12-in. centres of high speed type, planing machine 6-ft. by 6-ft. by 18-ft. travel, 36-in. centre lathe for crank shafts, 6 stroke slotting machine, gear wheel cutting machine capable of cutting wheels up to 4-ft. dia. and several milling machines and horizontal boring machines. The lower end of the bay is used for erecting machinery, and has an electrically driven overhead crane with a lifting capacity of 25 tons.

The brass finishing shop, which is principally used for ship furnishing work, contains lathes, drillers, milling machines and engraving machines, all capable of turning out brass work at short notice. The machinery here is also driven electrically by independent motors.

Electric Shop.—This is equipped to deal with repairs of all description, both A.C. and D.C. A large stock of material is carried, and entire ships installations can be fitted.

Galvanizing Shop.—The zinc is electrically deposited, articles being cleaned by sand blasting. The dimensions of the galvanizing tanks are 21-ft. 9-in. by 6-ft. 8½-in. by 5-ft. 6-in. and 6-ft. by 8-ft. by 5-ft. respectively. The plant is capable of dealing with three tons per day. Electro plating in copper, nickel and silver.

Pattern Shop.—The pattern shop, under the same roof as the machine and erecting shops, covers an area of 100-ft. by 70 ft. on the first floor, which is reached by a flight of stairs and an electric lift capable of raising 1 ton to deal with patterns to and from the foundries and wood from the sawmill. The traveling crane of 25 ton capacity, traversing the whole of the shop, raises the large timber and castings (which are to be renewed), coming from the harbor, from the machine shop floor to any part of the pattern shop. The main shaft, driven by a 10 h.p. motor, drives No. 1 lathe, a chuck on the mandril dealing with jobs up to 5-ft. dia., while the bed will deal with work 12-ft. long and 15-in. dia. Nos. 2 and 3 lathes deal with the smaller turned work. The band saw, 36-in. wheels, deals with work up to 8-in. thick, the table 3-ft. square, and can be angled to suit the work in hand, the distance from the saw to the inside of the gap being 3-ft.

The wondersander, a combination of spindle and surface sandpapering machine by Matthew Wylie & Co., is housed here together with the following machines:—

A jig saw, 4-in. stroke, the table 2-ft. 6-in. square and 2-ft. 2-in. in the gap. Driven off main shaft.

A patent pattern making machine by Wadkins, Leicester, is driven by an independent reversible motor, dealing with patterns of almost any size and shape.

A surface and thicknessing machine by Thomas White & Sons, deals with timber 24-in. wide by 8-in. thick, is also driven by an independent motor. By its side at a reasonable distance, is a surfacing machine of 12-in. capacity, having a fence to deal with angular timber.

A dimension sawing bench by sagar, carries a rip and a cross cut saw, each 15-in. dia., driven by separate motor.

A saw bench by Robinson, Rochdale, completes the machinery, this carrying a saw 22-in. dia. by 4-ft. 3-in. by 2-ft. 3-in. table, and motor.

There are 10 work benches, each capable of accommodating four workmen each.

Coppersmiths and Plumbers Department.—Adjoining the engine shop are the coppersmiths and plumbers shops occupying a building 127-ft. by 35-ft. wide, with glass and corrugated galvanized iron roof, efficient ventilation and light. This shop is equipped with all necessary and up-to-date methods for making and bending all sizes of pipes for shipbuilding and engineering work. In addition, sanitary engineering is done on a large scale, and heating apparatus for both ships and buildings.

Equipment.—Hydraulic plant capable of pressure up to 1,000 per sq. in. for bending all kinds and sizes of steel and copper pipes.

Eight forges fitted with under feed system of air blast, supplied by a Roots blower.

Vice benches and lockers to accommodate 200 men.

Overhead rail for traveling chain blocks over bending blocks and forges.

Electric lighting on the ½ watt. system, all overhead. Benches lit by projecting arms to each vice by 16 c.p. lamps.

Tinsmith's Department.—40-ft. by 42-ft. wide. This Department is responsible for making the models exhibited by this company at the British empire exhibition and is capable of undertaking the following:—

Air tanks for lifeboats and liferafts, ships domestic fittings, compass hoods, light water tanks, and all classes of sheet iron, tin and zinc work are turned out in considerable quantities. Steam heating and drying cabinets of all sizes, suitable for large hotels and passenger ships are made here complete. Ships navigation and other types of lamps are furnished by this department for ships as necessary. Plate rolls and wire crinkling machines are installed.

Vices and plate racks are also fitted, and all necessary dies and jigs for all classes of repeat work are available. In addition, a large store for ready issue of tools and material to workmen is installed.

Boiler Shop.—The boiler shop, a substantial building of stone and lime 330-ft. by 130-ft., is fitted with machines capable of building any size of boiler under Lloyd's and board of trade rules.

The following machines comprised therein, give one an idea of the capacity of this shop :—250-ton hydraulic double ram flanging machine, vertical rolls capable of taking in plates up to 2-in. thick, 5 screwing machines for screwing stays, 2 miling machines, 4 drilling machines, 4 electric overhead cranes, 60 ton, 45 ton, 35 ton and 15 ton respectively, 2 hydraulic rivetting machines, 2 planing machines, 2-5 ton hydraulic jib cranes over flanging machines and one annealing furnace capable of taking plates 18-ft. by 30-ft.

Smithy.—On the right of the machine shop, a separate building 200-ft. by 150-ft., is capable of carrying out all kinds of smith work for shipbuilding and engineering. The plant contains 2—1 ton, 7—10 cwt., and 1—5 cwt. electrically driven Massey's hammers, capable of making forgings to 20 tons weight, either in shingled iron or steel. The forge adjoining the Smithy is equipped with machines to turn out forgings to 20 tons weight either in shingled iron or steel. The plant comprises one steam hammer of 10 tons and one of 2 tons, for smaller work.

Moulding Shop.—The moulding shop at present under construction consists of three bays adjoining each other.

No. 1 Bay 320-ft. by 63-ft.—Contains one 10-ton and one 5-ton cupola, a steel melting furnace, one drying stove 25-ft. by 12-ft. by 10-ft., one annealing stove 25-ft. by 12-ft. by 10-ft., one small core drying stove 10-ft. by 8-ft. by 6-ft. and one magnetic separator and sifter. This bay is served with two 15 ton electric overhead traveling cranes, and one 5-ton mono-electric crane on each side of bay.

No. 2 or Centre Bay.—320-ft. by 56-ft. is the brass foundry, and contains one 8-ton brass furnace, one 5-ton brass furnace, and 4 small tilting brass furnaces, all served by one 15-ton overhead electric traveling crane.

No. 3 Bay.—For heavy iron casting work, is served by two 20-ton overhead electric traveling cranes, and one 5-ton monocrane, one each side of bay. It also contains one 10-ton cupola, and one drying stove 25-ft. by 12-ft. by 10-ft.

For rapid handling of material, the shop is well served with a heavy rail track to each bay, connecting machine shop and engine shop, and for the moulding of wheels, the shop is well equipped with a Whittaker's patent moulding machine, capable of moulding all classes of spur, bevel or helical wheels from a small pinion to a wheel of 15-ft. diameter. The daily output of the foundry is 80 tons of iron brass and steel castings.

Joiner Shop.—The joiner shop is housed in a recently constructed modern brick building, having re-inforced concrete floors on steel girders, supported on steel columns in two rows down the centre of building. The ground floor contains the sawmill. The first and upper floors have each an area of approximately 12,540 sq. ft., and are arranged in three bays with columns. The centre Bay in the former is utilized as a machine shop, and comprises up-to-date circular and band saws, fast feed moulder, oliver twin saws, whitney planer—large drum and disc sand papering machines, spindle machine, double tenoning machine, chain, hollow chisel and automatic slot blind mortising machine, automatic dovetail machine, vertical boring and routing machies and two turning lathes. Machines are all driven by motor power, some in groups and some by direct coupling to motor, and are worked by specially trained workmen capable of turning out first-class work, light or heavy. The side bays on both floors are arranged with benches for workmen, while the centre bay on the upper floor is used for the erecting of deckhouses, skylights, railway cars, tram cars and motor bus bodies, and all other work of a heavy nature. A portion of this floor is partitioned off for use as a polishing shop. The first and upper floors are served with a crane, capable of lowering material direct from shop to railway truck, and thence by electric crane to lighter, The whole building is well lighted and ventilated, thus affording every facility for carrying out all work in a speedy and first-class manner.

Sawmill.—Alongside the sawmill building is an electric traveling crane on a gantry, under which there are three frame saws and a circular saw with fifty-foot rack bench. This arrangement enables this department to convert logs and heavy timbers with ease. The mill is provided with modern high speed moulding and planing machines, circular saws and all the necessary smaller machines to enable the department to handle a large amount of work rapidly and efficiently. A variety of timbers are worked—teak and Douglas fir (Oregon pine) being the principal. An average of 600 tons of teak and two and a half million board feet of pine are worked in one year.

A heavy rail track is laid throughout the yards and workshops, and approximately 100 fire hydrants and numerous fire hose boxes are situated at convenient intervals. Each graving sock is provided with an independent electric fire pump, while two modern fire engines are kept in readiness for any outbreak.

Stores.—This department is one of importance, as in all shipbuilding yards situated far from manufacturing centres. A large and varied stock has to be carried, a vigilant eye has to be kept on depletions, due to the enormous demands made from time to time by the various departments engaged in shipbuilding, ship repairing, etc. The main store is a very substantial, well-ventilated structure of three stories of reinforced concrete floors on steel girders supported on steel columns. Handling of heavy stores is made easy by electric cranes to all departments. A feature of this department is that by a special arrangement of racks and bins, every article can be seen, making this store practically a show room. Everything is stocked from the proverbial needle to an anchor, in fact ocean-going ships have been built from stock, which fact is all the more creditable when it is borne in mind that the stores are thousands of miles from the manufacturing centres of Great Britain. The steel plate store is another fine building capable of housing 6,000 tons of material, handled by overhead electric travelling cranes. Further storage accommodation, situated on the ground floor of the main offices, contains valuable stocks of metals, tubes, bar steel, etc.

Staff Quarters.—The staff quarters will ultimately comprise 9 blocks containing in all 64 houses. The sites for these houses and the access roads to same, have been prepared by excavating and levelling on the ground acquired by the company for this purpose. The houses are built in terraces of 8 to 10 houses, each house is self-contained and contains a drawing room, dining room and pantry on the ground floor, with two bedrooms and two bathrooms on the first floor. An excellent basement extends from back to front under each house. In addition, each house has a good wide closed-in verandah with tiled floors on both front and back. The kitchens are provided for by a back wing at ground level and ample accommodation for servants is given to each house in a separate building at the back. In the construction of these quarters, it has been the policy to endeavor to provide buildings which will require a minimum of maintenance costs, and with this object all the floors and roofs have been formed of reinforced concrete slabs, and also for coolness, an air space has been provided in the roof. The buildings are built of Canton brick, and all the wood used throughout is of teak. Tennis courts, bowling green and recreation grounds have been provided for the use of the staff, while the bathing beach in front of the first two blocks of houses, is considered by many to be the best in the colony.

Counting House and Offices.—The counting house, offices and drawing offices are contained in one steel framed brick building, 380-in. by 65-in, situated between Nos. 2 and 3 docks. The floors and roofs are of reinforced concrete slabs, while the woodwork throughout is of teak.

A relay automatic telephone system is in use throughout the offices and yard.

The properties of the company, including Kowloon, Cosmopolitan and Aberdeen Docks cover an area of 96.49 acres, Kowloon Docks alone occupying 68 acres. The company is in a position to undertake all kinds of shipbuilding, marine and land engineering work, in addition to all classes of salvage work.

The company's twin screw ocean-going tug and salvage steamer *Henry Keswick* is a most powerful tug—2,000 h.p. recently built and engined complete by the company, and equipped with the most modern salvage plant and appliances for salvage work.

During a busy time, the Kowloon Docks have employed as many as 10,000 workmen, supervised by over 100 European foremen, experienced in every department of engineering and shipbuilding. A plentiful supply of native skilled labor is always available, and in this connection it may be interesting to mention that during the last year, the company spent in wages, an average of £25,000 per month, while during a busy spell, the wages bill per month reaches £40,000.

The Kowloon Shops of the Hongkong and Whampoa Dock Co., Ltd.

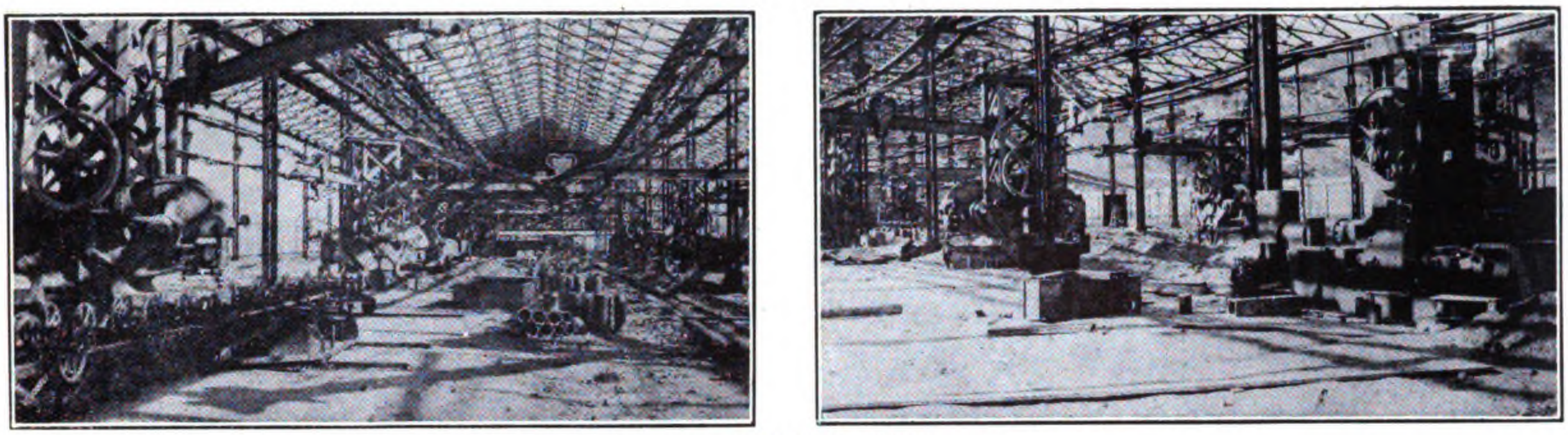
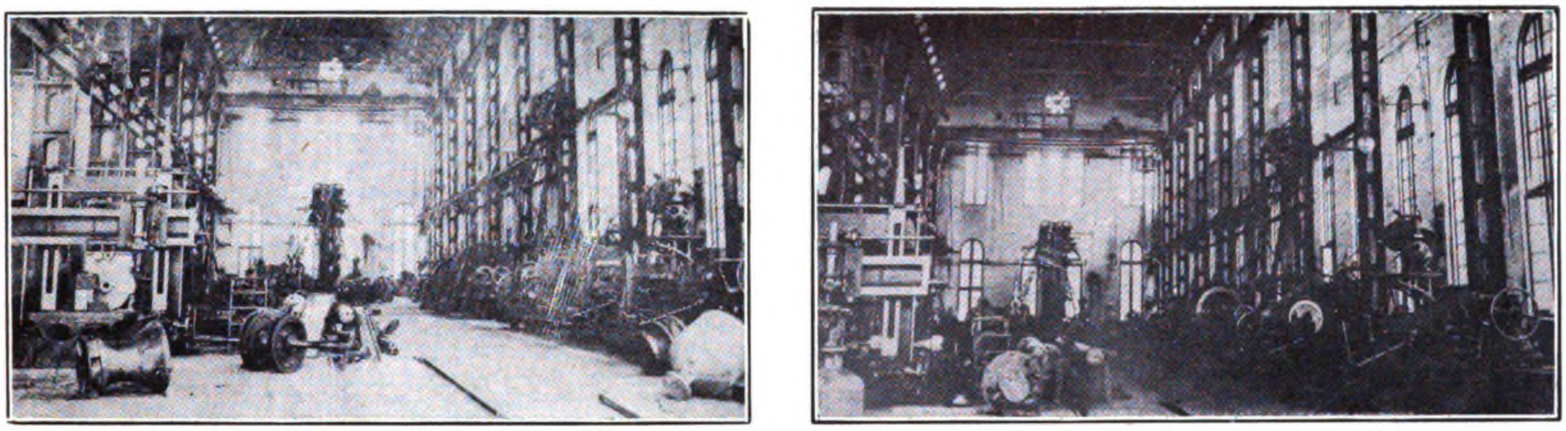


PLATE BENDING SHOP



THE MACHINE SHOP

Cosmopolitan Dock.

In addition to the docks and shipbuilding yards at Kowloon, the company possesses a graving dock and shipbuilding and engineering yard known as Cosmopolitan Dock. This yard is situated on the west side of Kowloon Peninsula, and is about 15 minutes by launch from the island of Hongkong.

The dock is capable of taking ships up to 450-ft. by 57-ft. beam, and is built of granite. The dimensions of the dock are as follows:

Length from bilge of caisson to coping head	476-ft. 0-in.
Breadth of entrance at coping	85 ,, 6 ,,
Breadth of entrance at sill	58 ,, 0 ,,
Depth of water over sill, O.H.W.	21 ,, 9 ,,
Depth of water over sill, at ordinary spring tides	20 ,, 0 ,,

The pump house is equipped with two 27-in. centrifugal pumps driven by 2 h.t. slipring motors capable of developing 150 h.p. on a 2,200 volt, 3 phase, 60 cycle motor. The pumps are capable of emptying the dock, containing approximately 20,000 tons of water, in two hours and a half.

The buildings at this establishment comprise pattern shops, foundry, coppersmith's shop, heavy and light machine shops, smithy, boiler shop, sawmill and light ship building sheds. These buildings, which are all within easy reach of the dock, have recently been re-constructed, and are of a substantial type, as may be seen from the photographs. The plant which has been brought well up-to-date, is electrically driven throughout, and comprises almost 150 machines, each machines having an independent motor.

A pneumatic plant, hydraulic pumps, and electrically driven 6-in. fire pumps have recently been installed. Electrically driven overhead cranes operate in the machine shop and boiler shop.

The foundry is capable of turning out castings up to 15 tons, and is equipped with electrically driven cranes, and two patent brass furnaces.

The wharfs surrounding the dock are built of granite with six piers built with Billian piles and Yacal upper structures.

The sheerlegs capable of lifting 30 tons is built on the centre pier, and is operated by steam winches. Two hand cranes capable of lifting 10 tons and 5 tons, are fitted at the dock entrance, and on the north side of the yard. The depth of water at sheerlegs pier is 20-ft. at low tide.

Two patent slips with electrically driven winches capable of taking launches and small vessels up to 120-ft. are on the west side of the yard.

The anchorage of Cosmopolitan Dock is the best in the harbor of Hongkong, and well sheltered from typhoons. Three buoys with sound moorings are situated 800 feet off the Dock entrance.

Aberdeen Docks.

The property at Aberdeen referred to earlier, situated on the island of Hongkong, comprises the Hope Dock and the Lamont Dock. This is also a separate yard owned entirely by this company. These docks are of granite, and are of the following dimensions :—

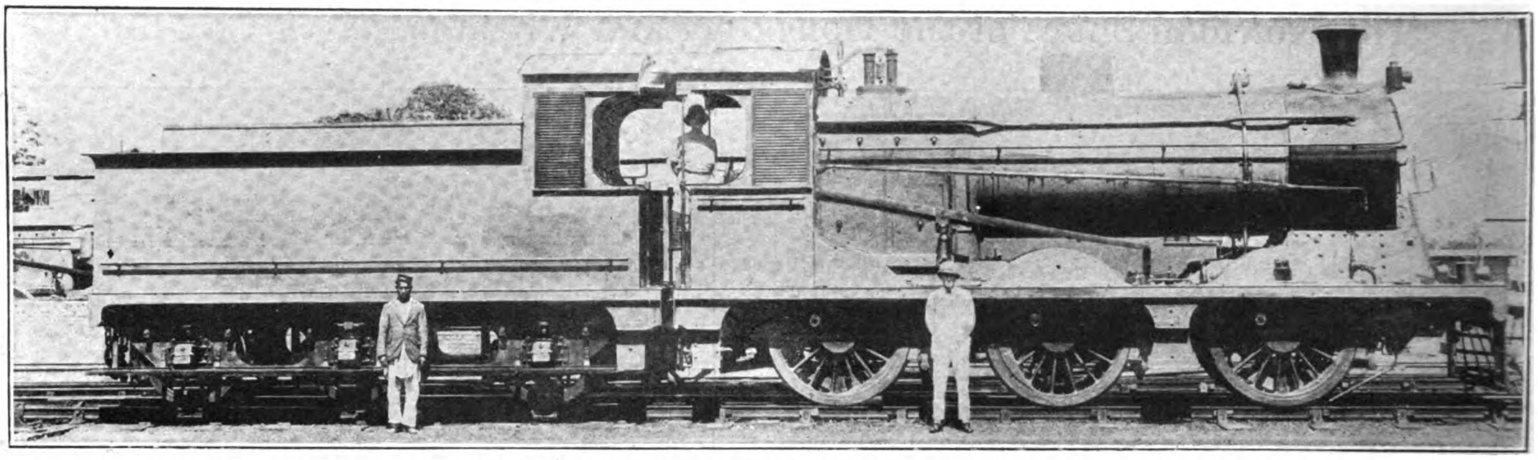
Hope Dock :—

Length from foorhead to bilge of caisson ..	433-ft. 0-in.
Breadth of entrance at coping	78 ,, 0 ,,
,, of dock coping	98 ,, 0 ,,
,, over keel blocks	56 ,, 4 ,,
Depth of water over sill, O.H.W.	23 ,, 0 ,,
,, ,, ,, O.L.W.	13 ,, 6 ,,
Height of first block over sill	2 ,, 6 ,,

Lamont Dock :—

Length from floorhead to bilge of caisson ..	326-ft. 0-in.
Breadth of entrance at coping	65 ,, 6 ,,
,, of dock coping	63 ,, 6 ,,
,, over keel blocks	43 ,, 6 ,,
Depth of water over sill, O.H.W.	16 ,, 0 ,,
,, ,, ,, O.L.W.	9 ,, 0 ,,
Height of first keel block over sill	2 ,, 4 ,,

The property on this site consists of a large European bungalow, cookhouses, office buildings, stores and machine shops. The docks and buildings are in a good state of repair, and are very valuable as an overflow establishment, when the other docks belonging to the company are occupied.



First Locomotive Landed and Ready to Leave for Home Station.

The Activities of a Great British Firm

Sir W. G. Armstrong, Whitworth & Company, Ltd.

Shipping Complete Locomotives from the Tyne to India

IN our January issue appeared an article describing the preliminary arrangements for shipping a cargo of 13 completed locomotives from Newcastle-on-Tyne direct to Calcutta there to be unloaded on the wharf and ready for starting off under their own steam. This shipment has since been delivered by Sir W. G. Armstrong, Whitworth & Company, Ltd. in conjunction with Messrs. Christen Smith Rederei, under supervision of the East India Railway Company. The engines conform to the following specification :—

0-6-0 Type. SUPERHEATED LOCOMOTIVE Gauge 5-ft. 6-in.

Cylinders	Diameter	20-in.	Heating	Tubes	917 sq. ft.
	Stroke	26-in.	Surface	Elements	223 ,, ,,
Wheel	Coupled	5-ft. $1\frac{1}{2}$-in.		Firebox	126.3 ,, ,,
Diameters	Tender	3-ft. 7-in.		Total	1,266.3
	Firegrate Area				25.3 sq. ft.
Wheel Base	Rigid	15-ft. 6-in.			
	Total Engine	15-ft. 6-in.	Weight in	Engine	50.95 tons
	Total Engine and Tender	39-ft. $\frac{3}{8}$-in.	Working Order	Tender	40.25 ,,
				Total	91.20 ,,

Boiler Pressure 160-lbs. per sq. in.

Tractive effort at 85 per cent. boiler tank capacity 3,000 gallons pressure 23,000-lbs.

Boiler feed 2 G. & C. No. 9 fuel space, $7\frac{1}{2}$ tons.

Messrs. Christen Smith's s.s. *Belgot* was used for this purpose after being suitably modified at the Armstrong naval yard under the supervision of the owners.

For the purposes of this shipment the *Belgot* arrived at Elswick jetty, which is served by a 150-ton hydraulic crane: for loading on September 18 and was ready to clear with 12 engines and one tender on deck, and 1 engine and 12 tenders in the hold on September 23.

The *Belgot* commenced her voyage on September 24 and after stopping at Oran, Port Said and Aden, and meeting with several periods of heavy weather, arrived at the Kidderpur Dock, Calcutta, on October 3, having attained an average speed of 10.2 knots.

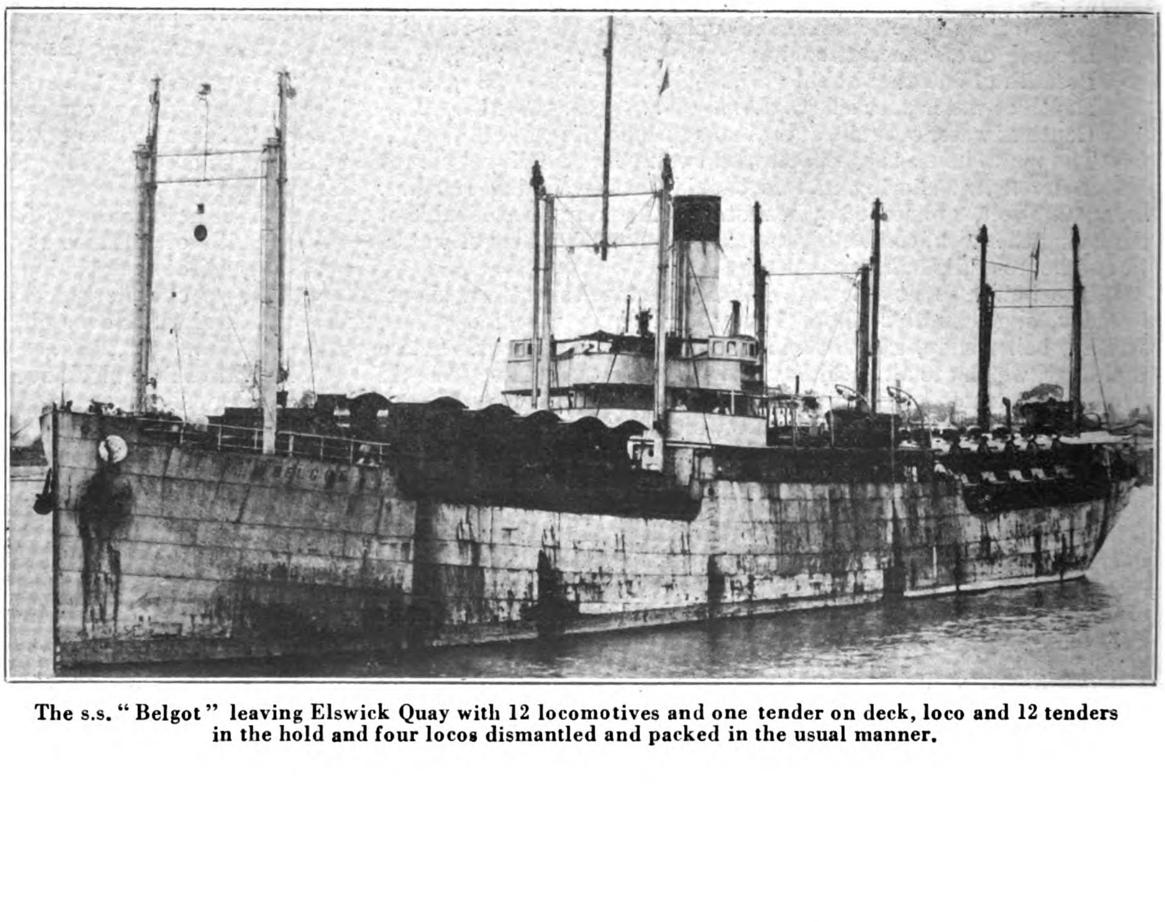
The tarpaulin covers were removed from the deck borne engines on the way up the river. The berth at the sheer legs being occupied, the *Belgot* did not berth until October 5 at noon and even then the first six engines were safely unloaded on to the quay by 6 p.m.

The first engine was hauled away to the Loco sheds of the East India Railway Company at dock junction east at 7.30 p.m. and owing to the arrangements made before shipment, negotiated the sharp curves which occur in this section in a satisfactory manner.

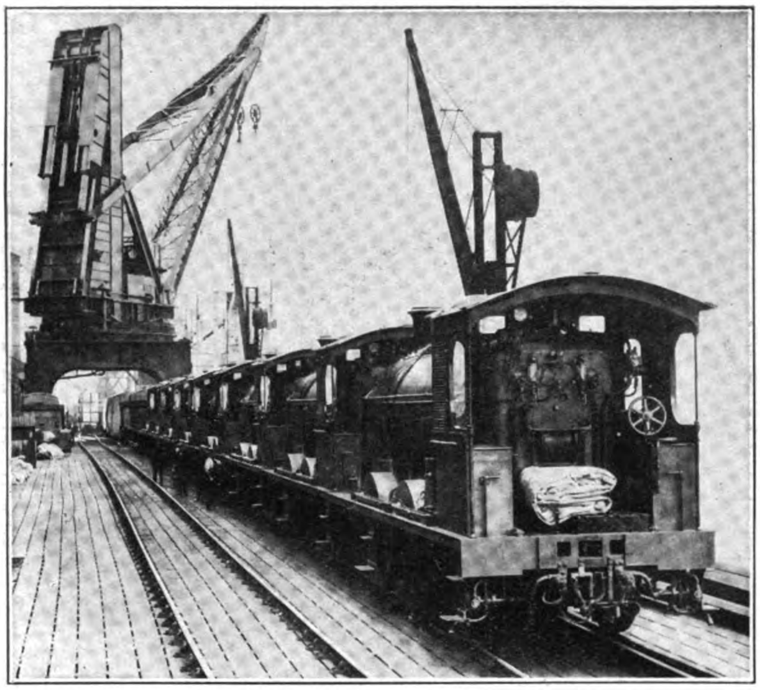
Saturday, October 6, was occupied by the East India Railway staff in examination and boiler testing to comply with the usual rules. The result of this test was completely satisfactory, every joint was found to be properly steam tight, and no rejointing was necessary at any point.

After lying over Sunday, the engine was steamed and ready to leave for its home station, Jha Jha, about 210 miles up to the line at 11 a.m. on Monday, October 9.

The journey was commenced at 1 o'clock, a halt being made at Bendel, 30 miles out, for examination. The engine being found



The s.s. "Belgot" leaving Elswick Quay with 12 locomotives and one tender on deck, loco and 12 tenders in the hold and four locos dismantled and packed in the usual manner.



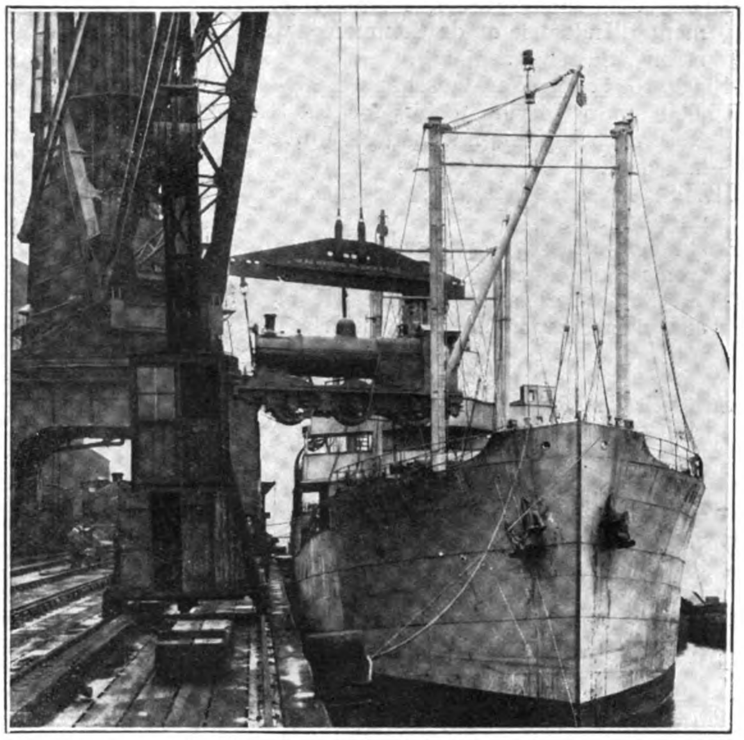
Locos Awaiting Shipment on the Elswick Quay, Newcastle-on-Tyne

satisfactory, the journey was continued to Asansol, a distance of ninety miles on which section it ran in front of the Punjab mail train. From this point it proceeded to Jha Jha, arriving in excellent shape.

This engine was passed into service two days later. The remaining engines followed in due course as fast as the dock junction staff could handle them and all were cleared by October 20. After examination of the first few engines had proved that they had not suffered in transit, much of the opening up for inspection which had been carried out with the first few engines was dispensed with.

This is by no means the first occasion upon which Messrs. Armstrong, Whitworth & Co., Ltd., have shipped locomotives in running order but hitherto the deliveries made have only been to Irish and continental ports.

Locomotives in erecting shop ready for shipment



Loading the Locos at Elswick Quay.

The outstanding success of this experiment has proved the practicability of shipping locomotives complete to any part of the world and should revolutionize existing methods.

The saving effected in both time and labor charges for re-erection is a most important matter and on the present occasion the arrival in running order was especially welcome owing to the pressure of work in the East India Railway's shops, which would have made the erection of a number of new engines a serious matter.

Shipbuilding Record

The oil tank steamer *San Salvador*, launched on January 22 at the shipyard of Sir W. G. Armstrong, Whitworth & Co., Ltd., is the 137th oil carrier built by the firm bringing their total output of this class of vessel up to nearly 600,000 tons.

The *San Salvador* is the 13th vessel they have constructed for the Eagle Oil Transport Co. and is a sister ship to the *San Quirino* launched from the Armstrong yard in May last.

The principal dimensions of the *San Salvador* are: Length overall, 420′ 5″; length between perpendiculars, 407′; breadth moulded, 52′; depth moulded to upper deck, 31′ 6″.

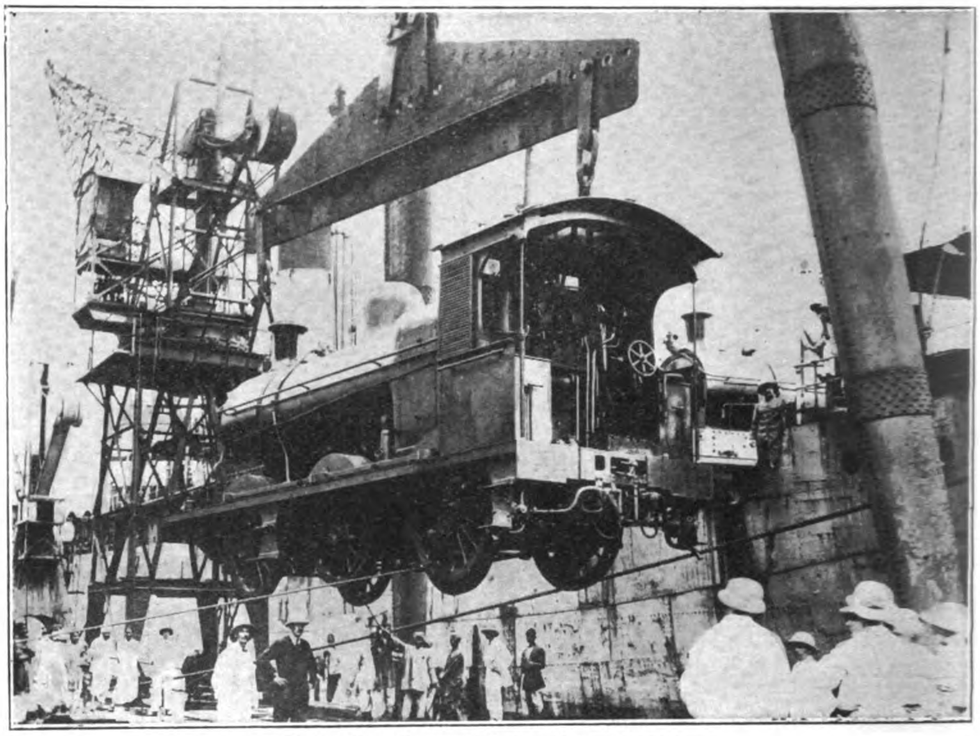
The vessel is designed to carry 8,250 tons on a mean draft of 25-ft. 3½-in. and her speed on trial, when loaded to this draft, is 11¼ knots. She is of the two deck type, with poop, bridge and forecastle, and is built to Lloyd's highest class and framed on the Isherwood system.

The following work is at present in hand at the shipyards of Armstrong, Whitworth & Co., Ltd. :—

ARMSTRONG YARDS

Ascania, cargo and passenger liner for the Cunard Steam Ship Co., launched on December 20, 1923.

10,000 tons tanker—Societe Anonyme d'Armoment d'Industrie et de Commerce, with Armstrong. Sulzer machinery.
10,000 tons oil tanker, vessel for sale.
60,000 tons floating dock for the Southern Railway Company, Southampton, five sections launched.
H.M.S. *Nelson*, battleship, for the British admiralty.
Girpshom' cargo and passenger liner, for Brostroms Lines Agency, Ltd., Gothenburg.
The Humberarm Pipe Line for the big hydroelectric scheme in Newfoundland.



Unloading the s.s. "Belgot" at Calcutta.

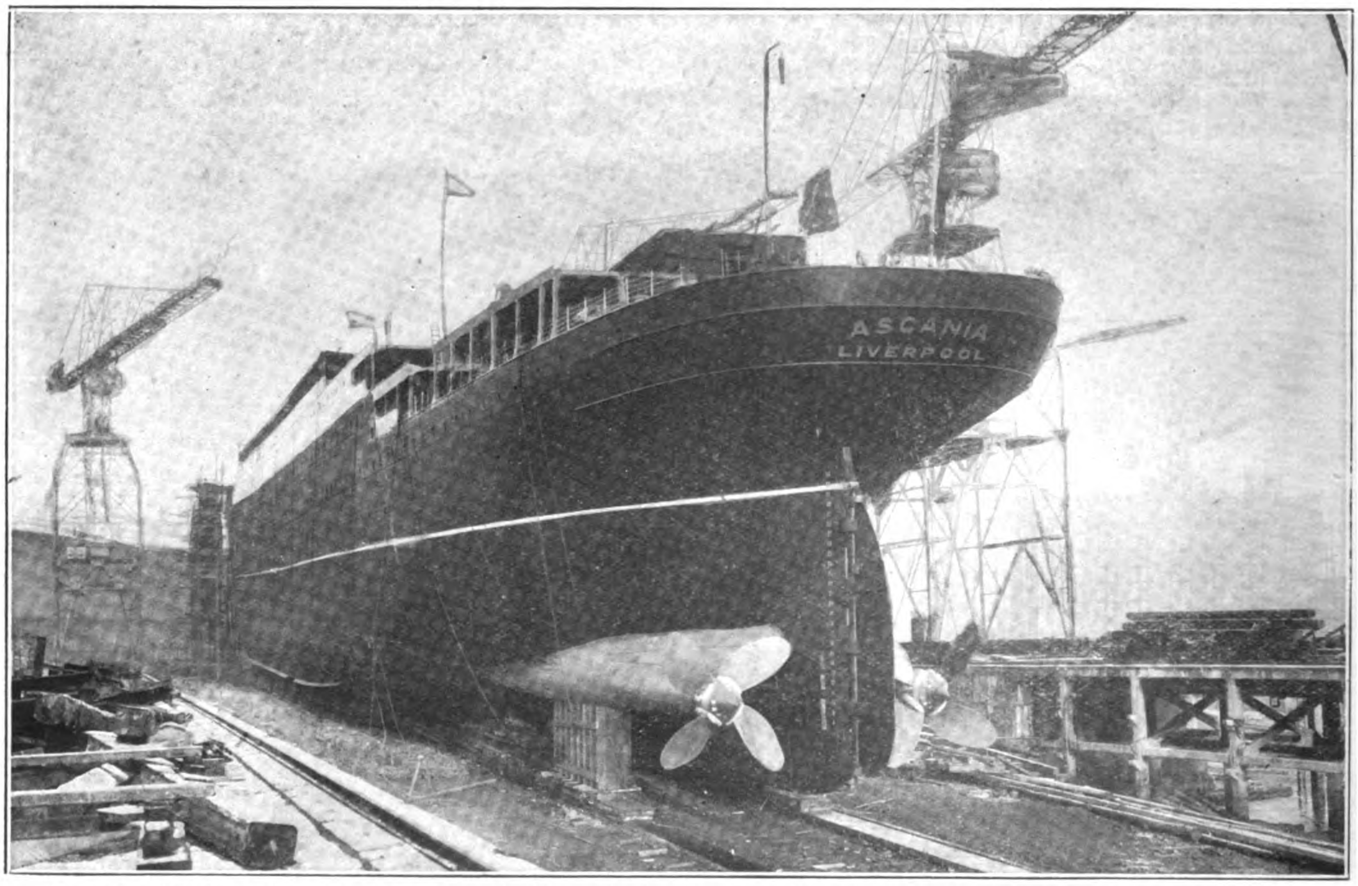
WALKER SHIPYARD

San Salvador, 8,000 tons oil tanker, for the Eagle Oil Transport Co., launched on the 22nd instant.
2—60-ft, gates for the London and North Eastern Railway, Co., Tyne Dock.
S.S. *Beldis* for Christian Smiths Rederi, Norway, fitted with Armstrong, Sulzer machinery.

In the British shipbuilding returns for 1923, Armstrong, Whitworth are placed 11th in a list of 163 companies. Only two vessels were launched during the year totalling 18,893 gross tons but small as this total is, it represents 3½ per cent. of the British output for the year. The aircraft carrier *Hermes* launched from the Armstrong, Whitworth yards in the summer of 1920 and at present completing at the Devonport Dockyard will be placed in commission early in February.

MARINE ENGINES

The shipbuilding returns for 1923 show that apart from Messrs. Harland & Wolff, Armstrong, Whitworth can claim the coveted distinction of having held the *Blue Riband* for the greatest output of marine engines for two successive years. The marine engine department is of purely post-war growth, having commenced operations in 1918. Machinery built in 1923 includes the turbines for the Cunard Liner *Ascania* and the P. & O. Liner *Mongolia* and totals 38,850 i.h.p.



Launch of the New Cunarder Liner "Ascania" from the Armstrong Yard of Sir W. G. Armstrong, Whitworth & Co., Ltd.

New Manchurian Bridge

The largest bridge in the Kwangtung Leased Territory was opened with appropriate ceremonies on May 14, in the presence of Director General Kawaguchi. This bridge which spans the Tashaho is 25 feet wide and 308 yards long and cost some Y.140,000. The bridge connects the Pulantien and Pitzuwo districts and is expected to increase traffic markedly from Pitzewo which is the most northerly port in the Leased Territory.

Some Exhibits at the British Empire Exhibition

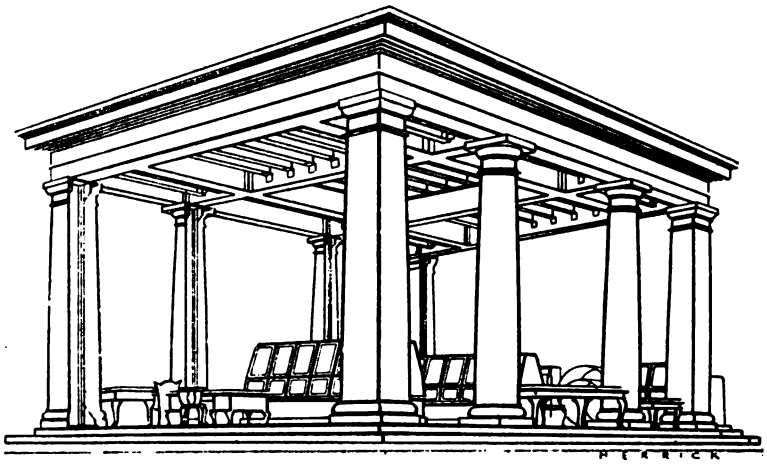
Mather and Platt, Ltd.; Dorman, Long & Company, Ltd.; Yarrow & Company, Ltd. and John I. Thornycroft, Ltd. Make Imposing Displays of Their Products

1. Mather & Platt, Ltd.

THE well-known house of Mather & Platt, Ltd., Manchester, are contributing to the success of the Wembley exhibition in no small fashion. Their name will be prominent in many parts of the exhibition, for their wide range of manufactures indicates their ability to serve the needs of many industries. Their part is by no means limited to the fine display they have staged for their own stand. The familiar name is displayed on every stand in the B.E.A.M.A. section of the palace of engineering, for every stand is equipped, for fire protection, by Mather & Platt " Simplex " chemical fire extinguishers. These have been chosen as affording the maximum protection against fire, in accordance with the very stringent rules laid down by the exhibition authorities.

On their own stand in Avenues 8 and 9, Bays 11 and 12, Messrs. Mather & Platt have a most imposing exhibit indicative of the work they are doing in pumping equipment for waterworks service. This splendid set is one of seven similar sets which are being supplied to the Calcutta corporation for the Mullick Ghat pumping station. By the courtesy of the Calcutta corporation and of the chief engineer, J. R. Coats, Esq., B.Sc., M.Inst. C.E., this set is to remain throughout the whole exhibition as a fine example of British engineering. It comprises a high efficiency 18-in. " Medivane " pump, with a duty of 10,420 galls. per min., 140 feet head, 970 r.p.m. driven by a Mather & Platt 580 h.p. motor.

Mather & Platt have long been known for the excellence of their pumping and electrical equipment for mining service. It is therefore to be expected that an example of their robust design should figure amongst their exhibits—a six-stage Mather & Platt Plurovane high-lift pump, driven by a Mather & Platt mining-type 100 h.p. motor. This pump is designed for a duty of 750 galls. per min., 500 feet head, running at 1,450 r.p.m. Another exhibit is a Mather & Platt fire pump, motor, and automatic starter set—an exhibit whose general design and finish indicate its fitness for the important service it is destined to fill. A 6-in. Solovane pump, arranged of belt driving, is also exhibited.



The Dorman, Long Stand

Purely electrical exhibits on the Mather & Platt stand include an 80 k.w. D.C. generator and A.C. and D.C. motors.

Space precludes the exhibition of the heavier electrical manufactures of Mather & Platt, but it is interesting to note that a 500 k.w. rotary converter, with the unique Mather & Platt patent starting and self-synchronising system, has been supplied to the North Metropolitan Electric Power Supply Co., Ltd. for service in the exhibition grounds at Wembley. This machine will probably be open to inspection by the public.

The Textile Machine Makers' Association is equipping a working cotton mill at the exhibition, and Mather & Platt (who have a long experience in the electrical driving of textile machinery) are supplying eighteen electric motors for driving machines in this exhibit. The whole of the arrangements for fire protection, comprising a complete " Grinnell " automatic sprinkler and fire alarm installation, " Simplex " chemical extinguishers, " Armoured " fire doors, etc., are also carried out by Mather & Platt.

To the power house in the palace of engineering, in itself a working example of modern power house practice, Mather & Platt are supplying several auxiliaries. These include a 10-in. condenser circulating pump for Messrs. J. Musgrave & Sons, Ltd., a similar 12-in. pump to Messrs. Cole, Marchant & Morley, Ltd. for the same purpose, and a condenser extraction pump to the latter. These exhibits will be working continuously throughout the period of the exhibition. Miscellaneous small pumps for various duties have been supplied to other exhibitors.

In the *mining hall* the mining association are collecting a representative exhibition of models of mining machinery. To the collection Mather & Platt are loaning the original turbine pump—the first example of a multi-stage turbine pump—made by them is 1876 in conjunction with Prof. Osborne Reynolds.

The bleaching, printing, dyeing, finishing and kindred mahinery, for whose manufacture Mather & Platt are so well known, has far too wide a range to be represented adequately at one exhibition. There are shown, however, a clever model of a three-color printing machine, a L. & L. Weft straightener, and the " Vortex " humidifier, so extensively used to maintain suitable healthy conditions of humidity in textile and other factories. Electrolysers for the preparation of bleach liquors, for laundry use, for deodorisation, water purification, and many other uses, especially in hot countries are shown in large and smaller sizes. At the stand is also a Plauson patent colloid mill, a device for the preparation of emulsions and colloidal suspensions for inks, pigments, sizes, etc., and wax and oil emulsions, for textile and many other uses.

2. Dorman, Long & Company, Ltd.

THE great Teeside steelmakers, Dorman, Long & Company Limited, are erecting an exhibit of unusual interest at Stand No. 43 in the palace of engineering. A far-reaching feature of this large concern's business is their control of production from the raw material—coal and iron ore—up to the finished steel, of which latter they have an output capacity of one million tons per annum.

With these great resources their products cover a wide field of industry and on the stand a thoroughly representative display will be on view of their various manufactures. Apart, however, from the samples exhibited the stand itself will claim much attention since it has been designed specially by Sir Edwin Lutyens, R.A., the eminent architect and creator of the stately cenotaph in Whitehall. The severe simplicity and beauty of line in the design of the stand has been translated into stone and marble in a manner that exemplifies the relationship between the architectural stonework or casing and the vital steel skeleton in the modern steel framed building. Certain portions are left open to show the construction of the internal steelwork of the columns and the roof.

The examples and specimens to be shown will include :—

Durham coal—from the company's several collieries, including coal for steam raising, gas production, coke making, and household purposes.

Coke for use in the blast furnaces for the production of iron.

By-products of coal, a most interesting section comprising a wide range of chemicals produced at the Company's central refinery and including benzol for motor spirit ; coal tar, the source of synthetic dyes, drugs and perfumes ; creosote, for timber preservation ; and sulphate of ammonia, the richest known nitrogenous artificial fertilizer, for use in agriculture.

Ironstone, from the company's Cleveland mines and from a quarry in Northamptonshire.

Pig iron, specimens of the various well-known brands manufactured by the company.

The " Carlton " brands of ferro-manganese and Spiegeleisen.

Durham fire bricks from the company's own brickworks, for the lining of coke ovens and furnace flues.

Crushed slag for roads and concreting.

A ten-ton ingot of basic open hearth steel, representative of the company's output capacity of upwards one million tons of this steel per annum.

Blooms, billets and slabs of basic open hearth steel, for the manufacture of axles, crank pins, drawbars, bolts and nuts. For hammers, shovels, chisels, springs, saws, rifle barrels, shells and motor car bodies, etc.

The full range of New British standard beams (29 sections), channels (18 sections), equal and unequal angles (36 sections), bulb angles and tees (28 sections).

Specimens of pressed plate and rolled steel troughing for the flooring of buildings and decking of bridges.

A wide range of flat bars, round bars and square bars.

Specimens of the British standard bull-head and flange railway rails and tram-rails ; and a very interestings election of various special sections rolled in recent years for railways and tramways abroad.

Specimens of electric conductor rails for the electrification of railways including an unusual section for the central Argentine railway.

Examples of fishplates and soleplates and two complete specimen rail joints, one a standard British section and the other for the Great Indian Peninsula Railway.

Sections of bridge rails and light colliery rails and a number of other small special sections.

Of particular interest are four specimens of Dorman, Long's steel bent cold, showing its great ductility.

Steel plates for shipbuilding and constructional engineering work in thickness of from 3/16-in., to 2 inches, in length to 100 feet and in width to 9 feet.

Universal mill plates for bridge building and structural work, rolled simultaneously on sides and both edges and so eliminating edge shearing and machining by the user.

Riveted steel pipes—sections of the 72 and 57 inch diameter pipe lines for the Bombay municipality water supply. This contract is now being carried out in India by Braithwaite & Co., Engineers Ltd. (associated with Dorman, Long & Co.), and requires 80,000 tons of steel plates. The length to be provided is 80 miles of 72 inch pipe and 30 miles of 57 inch pipe.

Galvanized and black steel sheets. Specimens are shown of typical sheets and rainwater goods, ventilator louvres, fencing pales and glazing strips.

Wire. Galvanised steel hawser wire to Lloyd's tests, plough steel wire for colliery and lift ropes, steel railway signal wire, telegraph and telephone wire, galvanised rigging and seizing wire, galvanised armoring wire for submarine cables, drawn fencing wire, galvanised barbed wire, and steel rods for reinforcement of concrete.

There will also be shown a water color drawing (by Sir John Burnet & Partners) of Sidney Harbor Bridge. This is to be an arch bridge of 1,650 feet clear span—the largest single span bridge in the world—the total length of the arch and approach spans being 3,770-ft. Headroom for vessels passing in or out of the harbor will be 170-ft. at high water and the height to the top of the arch will be 470-ft. above high water. The bridge is to carry four railway tracks, as well as a 57-ft. roadway and two footways, and will have a total width of 160-ft. This contract was placed with Dorman, Long & Company by the New South Wales government in February, 1924.

3. Yarrow & Company, Ltd.

OWING to the success of the Yarrow patent water-tube boiler (land type) a large-scale model some 14-ft. high of the latest type of Yarrow boiler is shown. This model, which is about one-third full size, is of a similar design of boiler to that which Messes. Yarrow are constructing for different power stations and factories both in Great Britain and abroad. This boiler is also fitted with the Yarrow patent superheater and the Yarrow patent airheater. The boiler is shown with the front casing removed so that the design and construction of the different parts of the boiler can be easily seen.

Among orders that Messrs. Yarrow & Co. have received for their land type of boiler it may be of interest to mention the boilers for the country of London Electric Supply Co.'s new super-power station at Barking ; The Newcastle-upon-Tyne Electric Supply Co. boilers for the corporation of Brighton, Londonderry and Gravesend, and boilers for various industrial factories such as Messrs. J. & P. Coats, the Burmah Oil Company, and some sugar refineries in Scotland. Yarrow boilers are also being made for a power station in Holland, by a Dutch firm who are licensees of Messrs. Yarrow & Co.

A model is exhibited of the latest type of Yarrow patent marine boiler, fitted for oil burning, part of the casing having been removed showing the tube rows as well as the superheater. The actual boiler of this design is capable of generating steam for a 12,000 horse-power turbine installation.

Yarrow boilers to the extent of over 25,000,000 horse-power have been constructed or are in course of construction, and during the great war over 90 per cent. of the warships built for the British navy were fitted with Yarrow boilers.

There is also shown the first Yarrow boiler, built in 1887. This is the actual original boiler from which a great deal of experimenting was done, resulting in the present type, and it is interesting from an historical point of view

An exhibit is shown of the *Cutty Sark*, built by Messrs. Yarrow & Co., to the order of Henry Keswick, Esq., Dumfries ; a high speed turbine-driven yacht giving a speed of 21 knots, steam being supplied to the turbine machinery by two oil-fired Yarrow boilers. This yacht which is very well fitted up, has made several voyages including a trip right round the world.

There is also shown a motor yacht (Yarrow type) of 129-ft. by 20-ft., being an example of a type of same designed and constructed by Messrs. Yarrow & Co. and propelled by either steam or internal combustion engines.

Models are also shown of the following shallow draft river steamers (Yarrow type) :—

A shallow draft vessel 210-ft. overall by 33-ft. beam, and draft of 5-ft. propelled by screws working in tunnels fitted with Yarrow's patent automatic flap, for service on one of the rivers in the East.

One of the river gunboats 230-ft. long by 36-ft. beam, designed by Messrs. Yarrow & Co., which took a prominent part in the operations at Mesopotamia during the war. Twelve gunboats of this design were built and sixteen of a smaller type were also designed and constructed by Messrs. Yarrow & Co. All the shallow draft river gunboats constructed during the war were designed and built under the supervision of Messrs. Yarrow & Co. Although this model illustrates a gunboat, the type is equally suitable as a passenger or cargo steamer.

On certain rivers it is found that the stern paddle wheel gives excellent results. As example of a shallow draft vessel so propelled, by this means, is shown in a separate model of the *Mosquito* and *Herald*. This type of vessel lends itself admirably to the employment of unskilled or native labor owing to its extreme simplicity.

A model is shown of a small shallow draft steamer (Yarrow type) 75-ft. long, of which a large number have been built for different parts of the world.

A model is also shown of the fastest destroyer in the world, H.M.S. *Tyrian* designed and constructed by Messrs. Yarrow & Co. and which obtained a speed of 40 knots. This is of particular interest in view of the important part high speed destroyers took in the recent war.

4. John I. Thornycroft & Co., Ltd.

JOHN I. Thornycroft & Co., Limited will be exhibiting in two sections of the palace of engineering, while other examples of their productions will be on view elsewhere, brief particulars of which follow :

1.—" *Palace of Engineering* " (*Mechanical Engineering Section*), *Stand No.* 141.

The space allotted is quite inadequate to enable anything like a fully representative display of their productions to be made, but there will be on view at this stand a representative range of Thornycroft marine engines suitable for different types of craft, many hundreds of which are in service throughout the world.

Similar engines equipped for stationary use as lighting, pumping, salvage or portable power sets, will also be on view also examples of Thornycroft propellers and oil fuel apparatus. Even more attractive will be the exhibits of models representing different types of river and sea-going boats they have built, ranging from small river craft to cargo vessels, oil tankers and torpedo-boat destroyers.

2.—" *Palace of Engineering* " (*Motor Transport Section*), *Stand No.* 35.

Here amongst the collective exhibit of the Society of Motor Manufacturers and Traders will be displayed a Thornycroft type " Q " 5-ton tank wagon suitable for the transport of motor spirit for the Anglo-American Oil Co. Limitations of space will only permit of this one example from the wide range of Thornycroft motor vehicles now supplied for loads from 2 to 11 tons for the transport of goods, also vehicles for passenger or municipal service. It has, however, been arranged for this exhibit to be changed from time to time to permit other Thornycroft vehicles to be shown during the period of the exhibition.

Elsewhere in the exhibition buildings and grounds there will be many other examples of Thornycroft productions deserving of the attention of visitors to whom these are of interest. Brief particulars are as follow :

3.—At a special pavilion alongside the *India Pavilion* will be exhibited a 38-ft. motor boat constructed entirely of India and Burma timbers, for the express purpose of demonstrating the resources of these countries for timber suitable for such work. The construction of this was entrusted by the authorities to John I. Thornycroft & Company, Limited, who have given very special attention to the choice of these timbers, which provide not only the strongest and most durable but also the most attractive and decorative which the world can supply. The hull of the boat is constructed entirely of Burma teak, each plank being in one length from end to end, in top sides. The coamings, hatchways and deck house are of Andaman paudauk, and the interior woodwork is, in the aft cabin, in laurel wood, and in the fore cabin in silver greywood. The Indian laurel wood, paudauk and silver greywood, was supplied by the government of India, and the teak by the government of Burma, through the sole agents for the sale of timber for both governments, Messrs. W. W. Howard Brothers & Company. This boat has been fitted out for private cruising and is of a type also suitable for port officers, customs, pilot or similar service.

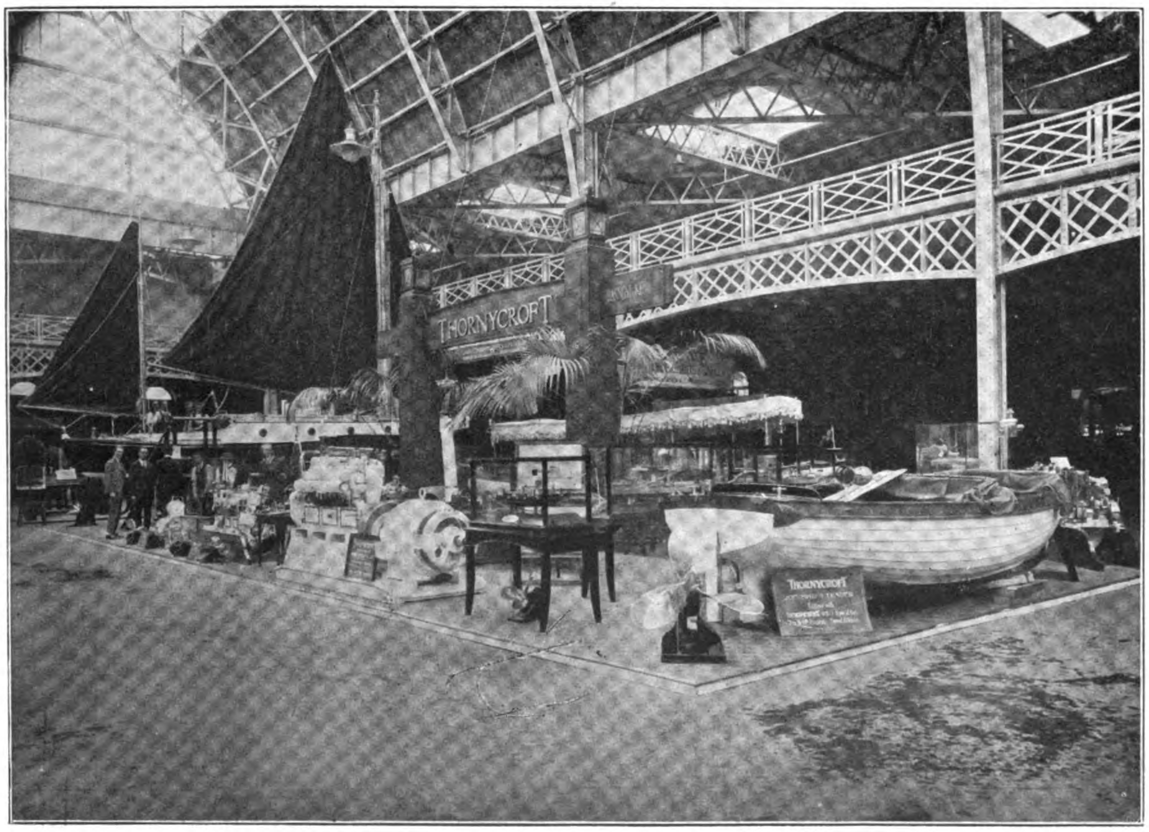
It is fitted with a Thornycroft type DB/2 9 b.h.p. motor, the high efficiency of which renders it of ample power for such a large boat, while its low fuel consumption is a considerable advantage for overseas service.

4.—*The Department of Tropical Hygiene exhibit in the British Government Pavilion* will include two models of motor vessels constructed by Thornycroft's for red cross and hospital service ; one of the famous hospital ship *Nabha* presented by the Maharajah of Nabha for war service in Mesopotamia, and a model of a 50-ft. boat completely equipped with stretcher racks, cots, isolation ward and medical staff accommodation, representing a type of boat of particular interest to medical officers abroad.

5.—On the ornamental water which will be one of the attractions of the exhibition grounds, a fleet of 30 passenger boats, capable of accommodating 18/20 persons, will be running and no doubt in very great demand. Their conditions of service necessitated a special type of boat, for which tenders and designs were invited from a large number of builders in the United Kingdom, and eventually they were entrusted to Messrs. Thornycroft whose design was considered to be by far the most suitable, while their extensive resources will ensure the fleet being completed in good time for the exhibition. In view of the restricted space and special conditions, the boats are to be equipped with electric motors.

All these boats are floored throughout with Indian gurjunwood. One of them which is being specially fitted out for the use of distinguished visitors to the exhibition, is being planked with specially selected Burma mahogany, and fitted with selected poon from Madras.

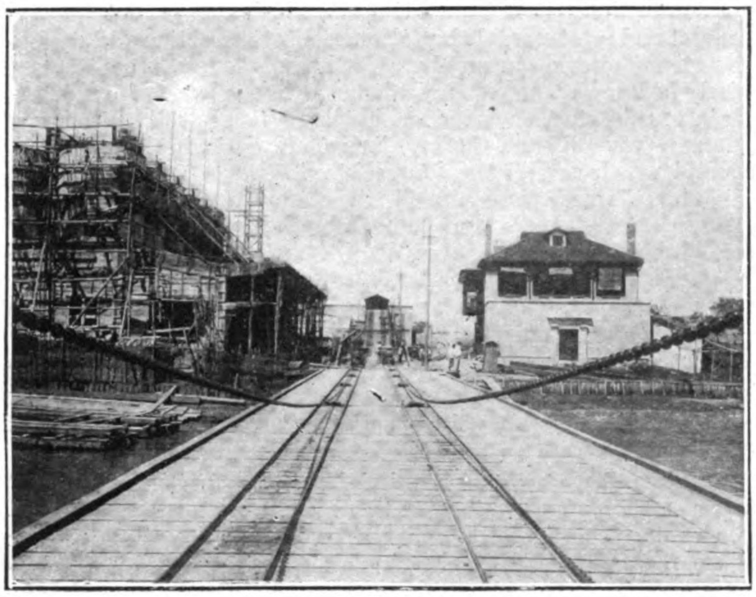
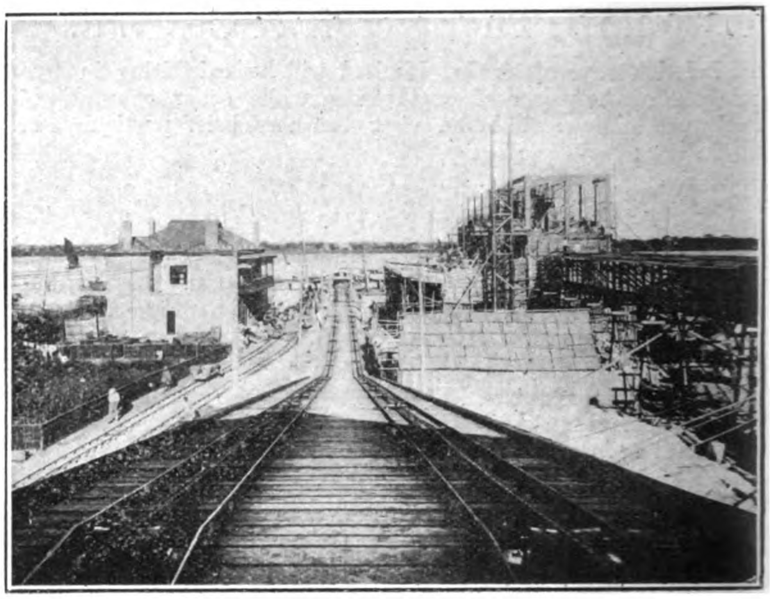
6.—A further example of Messrs. Thornycroft's work will be on view at Messrs. Dorman, Long & Company's stand No. 43, in the palace of engineering, at which the flooring will be in the form of a ship's decking. This has been specially selected and prepared from the round teak logs imported by the government of Burma, and is of the very best quality shipped from Rangoon, and commonly called Moulmein teak, representing a specially fine example of a ship's deck.



One of the Thornycroft Stands at the British Empire Exhibition

Haiho Bridge Tenders

The Haiho Conservancy Commission received 31 tenders for the bridge across the Haiho and it is expected that the award will be announced in a few days. This bridge will be placed to the west of the present bridge and form a continuation of the Rue de France. It is understood that most of the tenders were for a bridge of the bascule type with two moveable spans which meet in the center when lowered and yet permit the passage of all craft that now use the river when the spans are raised. The width of the bridge is specified at 40 feet and the time of completion before the end of next year.

Two Views of the Chain Railway from Wharves to Crusher House

The Shanghai Portland Cement Works

ONE of the most hopeful signs in China is the patriotic efforts of her merchants to develop her resources and industries. During the get-rich-quick excitement of 1920, a group of Shanghai's well-known merchants evolved a scheme for the establishment of a legitimate industry that would meet the growing demands for cement. The promoter was a man of great vision who had the energy and the resources to put his dreams into practical purposes. He realized that to properly develop her industries, China must have cheap coal, and in order to keep pace with modern reinforced concrete construction China must also produce more cement. The group of merchants led by this young man, O. S. Lieu, decided in August, 1920 to erect a modern cement plant, the first step towards what is now known as the Shanghai Portland Cement Works, Ltd.

Prospecting Quarries

The promoters secured the services of a technical expert to advise them during the organization and act as Engineer-in-chief of the works after erection. The offer was made to Mr. H. Mollitor, formerly engineer-in-chief of the Hupeh Cement Works, whose excellent record and long residence in China, eminently qualified him for the task. Mr. Mollitor, commissioned by the promoters to locate suitable limestone quarries and clay deposits made extensive reconnaisances in the Provinces of Kiangsu, Chekiang and Anhui and recommended the stone quarry at Chen Wan Li (陳灣裡) at Wuchow, Chekiang, and the clay deposit at Zosé (淞江佘山) Sunkiang as best fitted for obtaining the raw materials from which a very high grade of cement could be produced. He, however, recommended against building the factory at or near the quarries for reasons explained elsewhere in this article.

Exterior View of Plant at Lunghua

Organization of the Company

Meanwhile the company was floated with an authorized capital of $2,000,000 silver and a board of directors was formed composed of the following well-known merchants: Mr. Chu Pao-san, Chairman, Dr. V. K. Li, Mr. Chang Chien, Mr. Chang Char, Mr. Doo Kia-quen, Mr. Hsieh Chung-sang, Mr. Y. L. Chang, Mr. K. E. Yang, Mr. K. S. Jackson Lieu, Mr. Lee Bah-ko, Mr. Zao Veng-hui, Mr. Han Yun-ken, Mr. O. S. Lieu.

Investigation in Europe and America

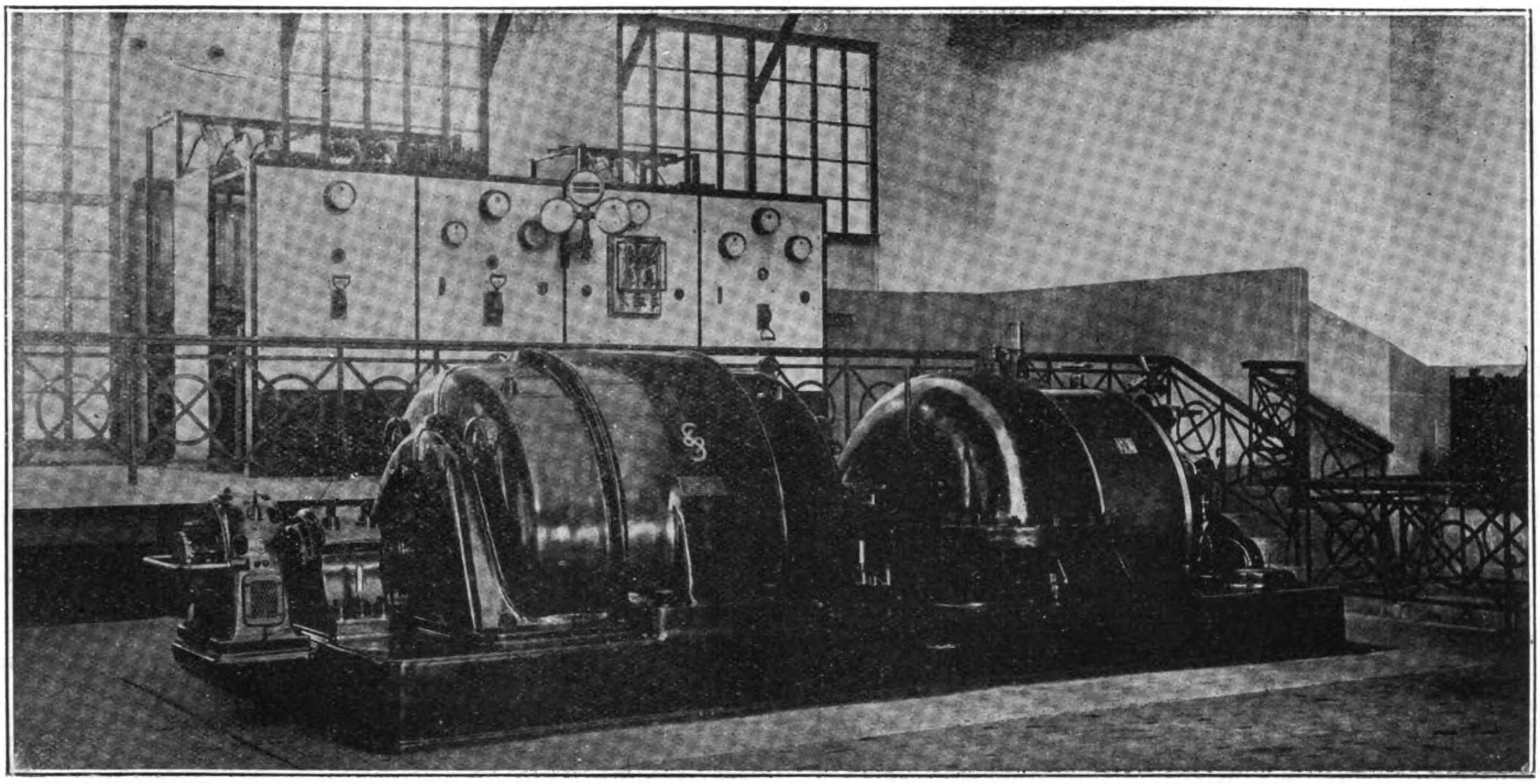
Representatives were sent to Europe and America to study cement manufacture and obtain machinery capable of producing the very highest grade of cement with up-to-date labor saving devices. Mr. H. Mollitor, was deputied to visit Europe, and in England, conferred with Mr. W. H. Brown, A.M.I. Mech. E., leading British authority on cement manufacture. Mr. Brown's advice and Mr. Mollitor's investigations guided the officials of the company in locating the factory site at Shanghai and in selecting the type of machinery to be erected.

Ths Situation of the Factory

The plant of the Shanghai Portland Cement works, is located on the bank of the Whangpu River three miles above the Kiangnan Dock, and about two miles from the Lunghwa Pagoda. The two tall re-inforced concrete chimneys cast the old familiar Pagoda landmark into a shadow. The factory occupies an area of one hundred and fifty mow of land with right of reclamation to another one hundred mow of riparian land along the Whangpu. The water-frontage acquired at nominal prices measures over one thousand feet; the most valuable asset of the Company.

Selection of Site

1. *Transportation Difficulties.*—To decide upon the

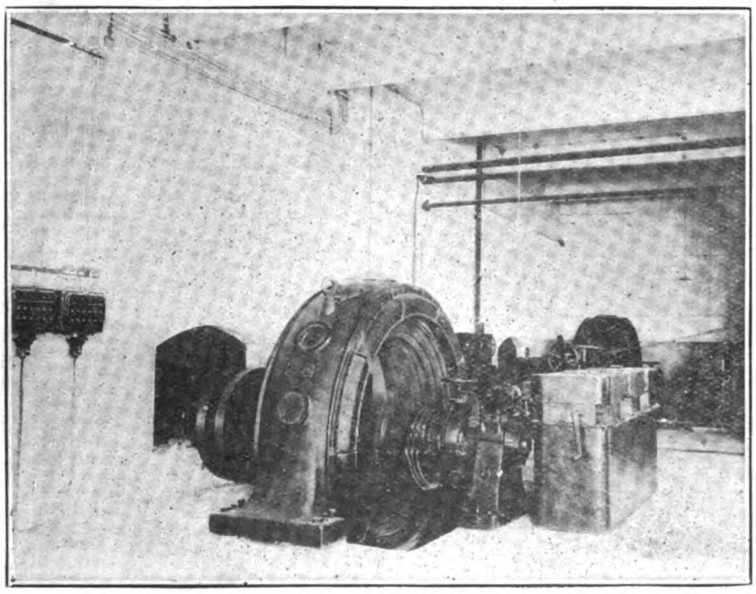


Shanghai Portland Cement Works Power Plant: 2,000 H.P., M.A.N. Turbine Coupled to 1,440 k.w., 50 cycles, 525 volts Siemens Generator

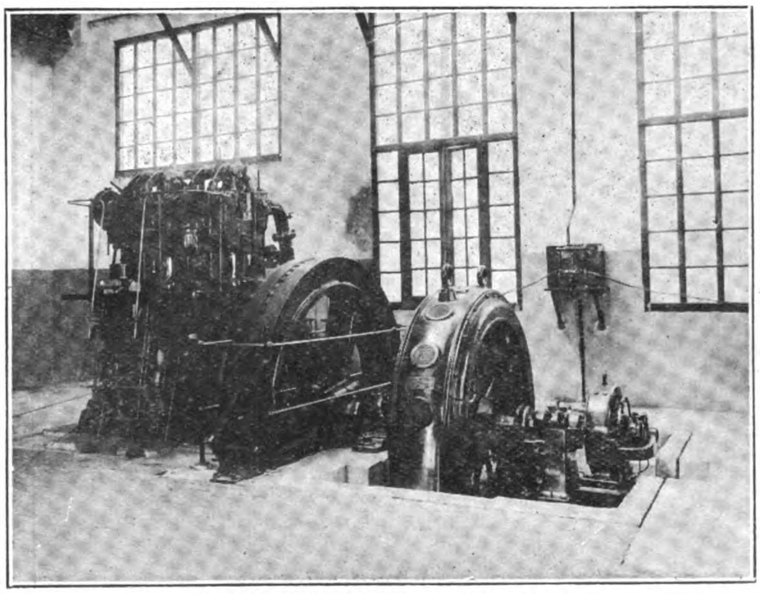
site for a cement factory, the economical transportation of raw materials (limestone, clay and coal) and the finished product must be given serious consideration. To warrant the erection of the factory at the limestone quarries a suitable grade of coal must be found in the same locality with facilities for easy communication with the market and sea-port for the export of the finished product. Such an ideal locality in China is not readily obtainable. Excellent raw materials for the manufacture of cement can be found in many places distant from the marketing centers and shipping ports rendering transportation of coal and finished product difficult and costly. In certain districts limestone and coal deposits are discovered together. But apart from the question of the quality of the coal, the two operations of cement manufacturing and coal mining mean two separate and extensive undertakings. If the advantage of the limestone quarry is alone considered, the coal must be transported to the factory by means of junks, entailing much loss, delay and uncertainty of supply. These difficulties would be repeated and intensified when the finished product is transported to the market, as cement must be transported in covered junks. Even then deterioration and damage will happen through careless handling and climatic changes. The Shanghai Portland Cement Works obtains its regular supply of limestone and clay from its own quarries in Wuchow and Sungkiang, conveyed by native junks at very reasonable charges and rain or shine the raw materials are daily received in quantities to suit the requirements of production. The works are not handicapped if a boatload of stone or clay turns turtle on the way or the contents are wet with rain nor with a suspension of boat traffic for a spell of one or two months. An immense stock of clay and stone sufficient for ten months consumtion is always kept on hand at the works. Coal is landed at the factory wharves direct from Chinwangtao by steamer. These wharves can accommodate steamers of over three thousand tons. Thus the cost of lighterage from coal yard, theft and watering by boatmen on the way to the interior are saved.

2. *Inconsistency of Limestone Quarries.*—Many cement factories in Europe and America had been forced to close down because the quality of the limestone has deteriorated as excavations became deeper. It was then too late to consider the transport of raw materials from other quarries, unless the factory was transplanted to another locality. To provide for this contingency Mr. Mollitor advised against erecting the plant at or near the quarries.

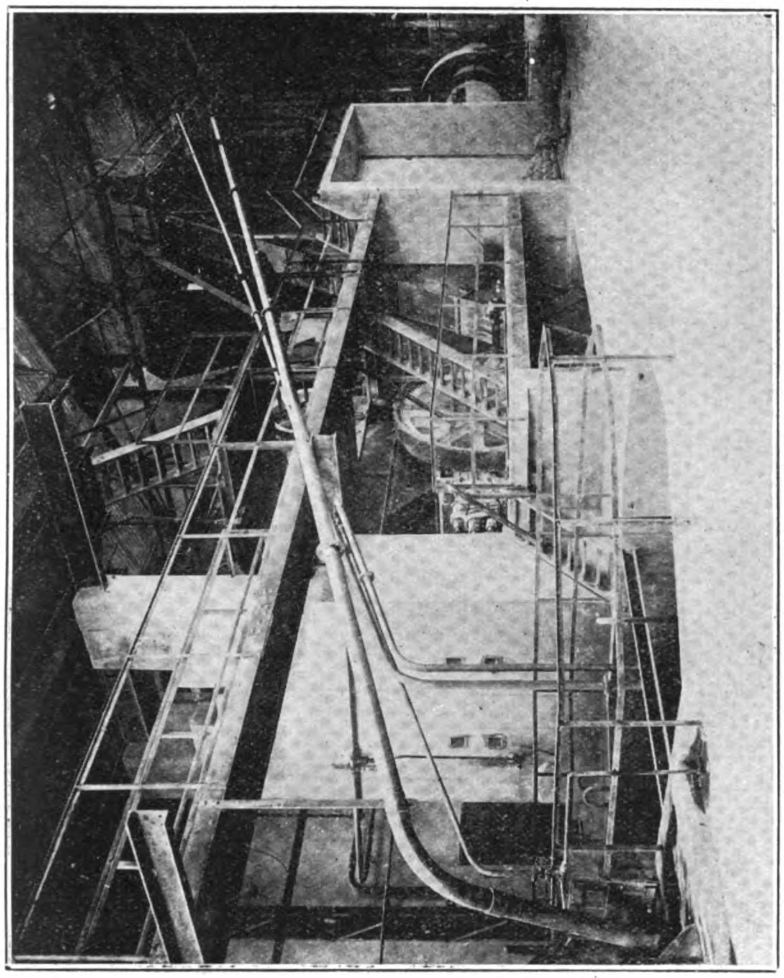
3. *Skilled labour and engineering materials.*—Shanghai is the



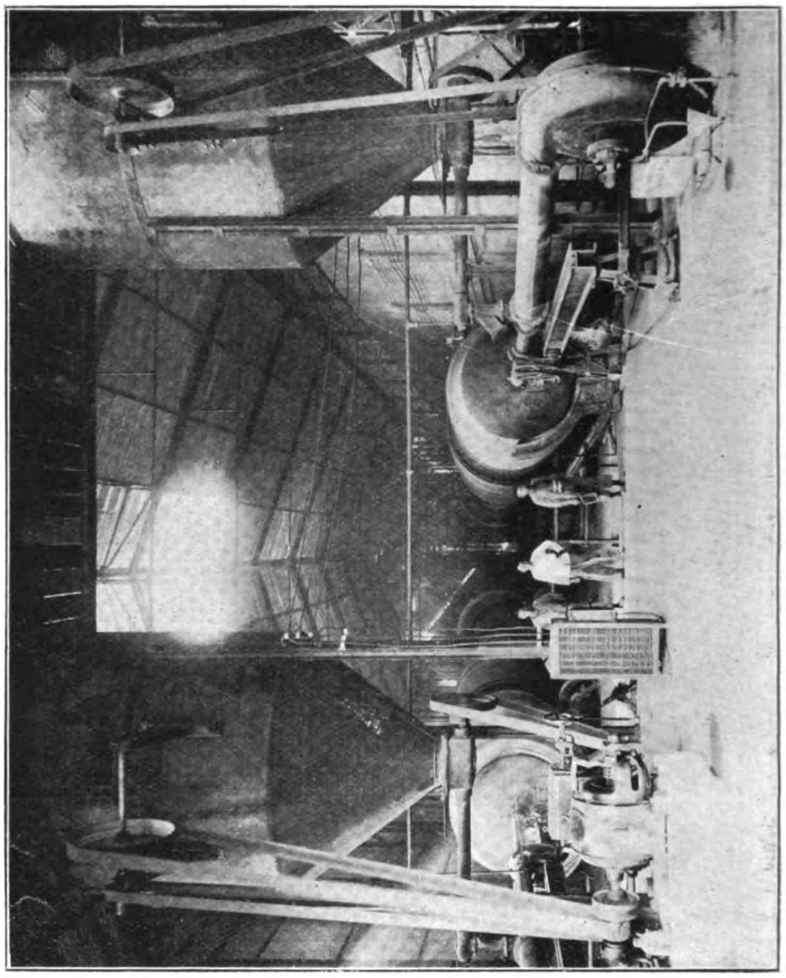
Motor in Crusher House



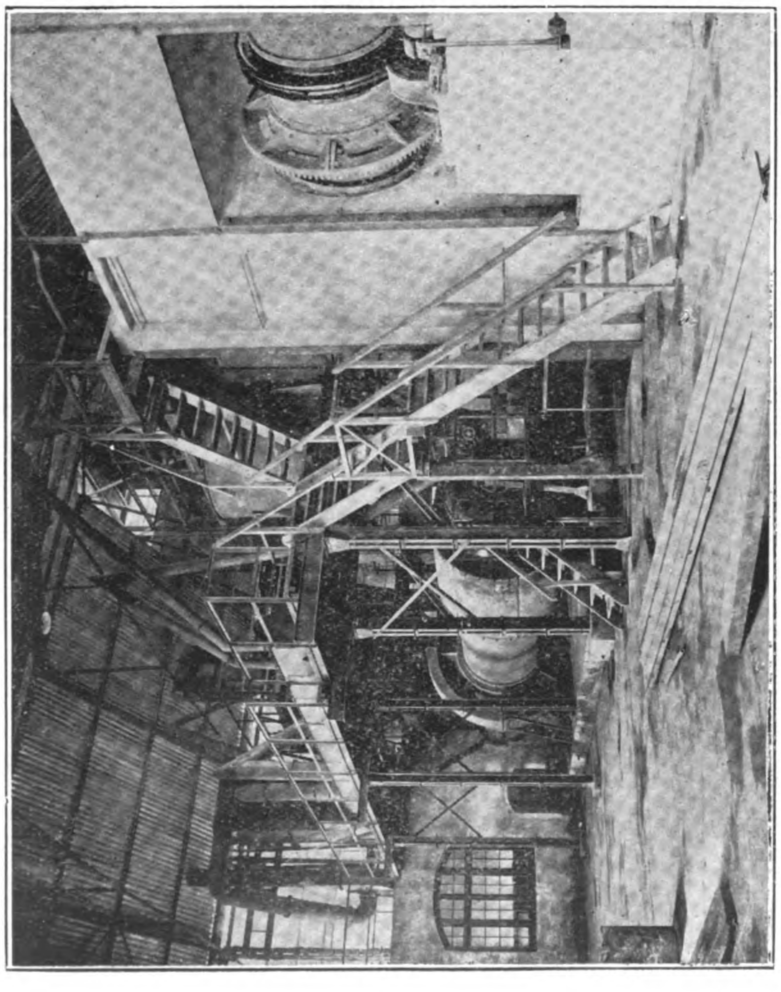
250 H.P. Diesel Engine and Generator



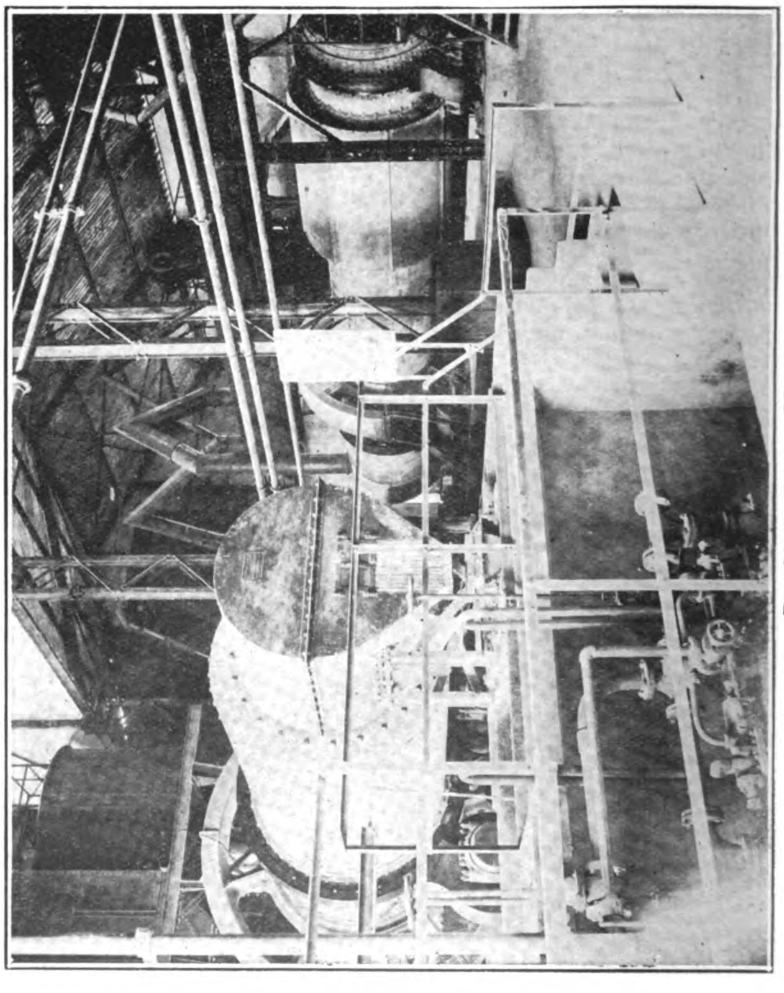
Crusher Above—Rollers Below



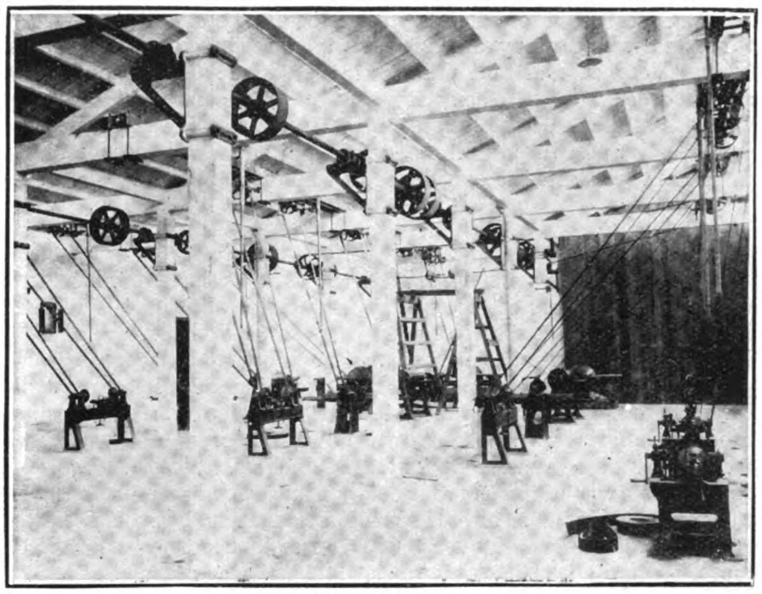
Rotary Kilns



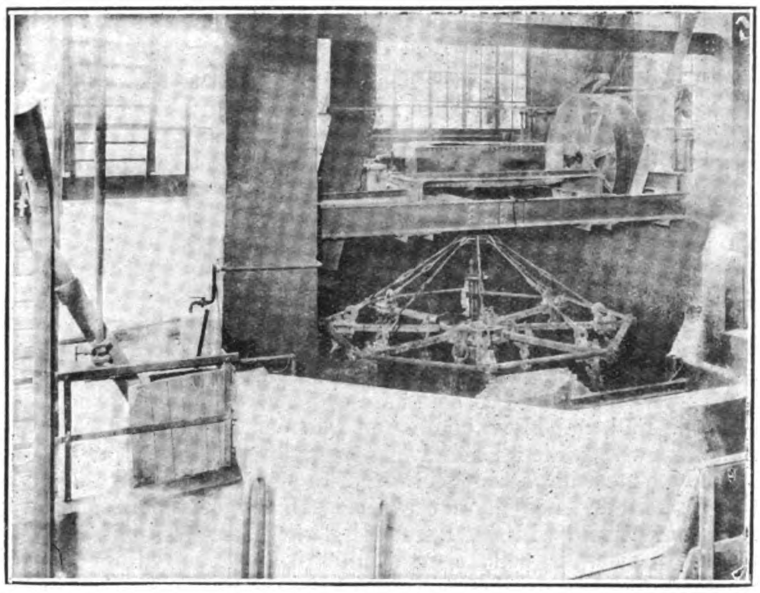
Coal Pulverizing Mill



Raw Mill—Cement Mill



Barrel Shop



Clay Wash Mill

one place in China where skilled labour can be had on short notice. In case of machinery breakdown, repairs can be completed far more expeditiously than elsewhere in China. Nor is it necessary to keep in stock a large supply of engineering materials thus saving a large amount of capital being tied up.

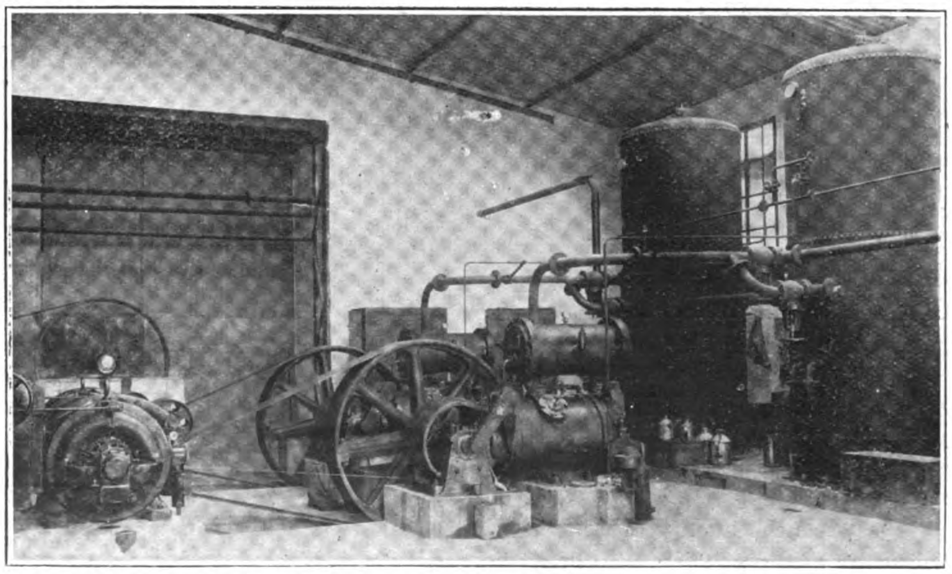
The Purchase of Machinery in Europe

In the choice of machinery for the new enterprise the directors accepted the plans submitted by Messrs. G. Polysius of Dessau, Germany, who manufacture cement machinery exclusively. This same firm equipped the Holderbank Factory of Switzerland in 1913, acknowledged by experts as one of the best in the world. In design and construction the machinery of the Shanghai Portland Cement Works is claimed to be even superior to the Holderbank installation.

Description of the Cement Plant

The plant is one homogeneous unit. The process of manufacture commences with the discharge of raw materials at the wharf fitted with electrically operated cranes for lifting limestone and clay from the junks. The stone and clay are hauled in tipping wagons up a chain railway, also electrically operated, into the crusher house. The cars are dumped, the stone falling into a mechanically working feeding grate which carries the stone into the crusher. From there the crushed stones pass into a roller mill from where the sized stones are conveyed by slanting elevators to the large bin situated above the raw material grinding mill. The clay carried up by the chain railway is dumped into the wash mill. The washed clay flows into what is called "the Pressors" which convey or press the clay by means of compressed air which is manufactured in another department, into another bin also situated above the raw material grinding mill. Both the sized stones and the washed clay are now fed by special feeding devices into the raw material grinding mill. The raw material grinding mill is a compound mill, called "Solo Mill," having two compartments to contain steel balls and flint stones respectively by which clay and stone are ground into fine slurry. The slurry flows into the pressors and is forced by compressed air into three separate tanks capable of holding four hundred tons each of the mixture. The functions of these tanks are for storage and for regulating the mixture so that a constant uniformity of the materials for production is obtained. The work of regulating or mixing the contents of the tanks is done by means of compressed air. This branch of work is in charge of the laboratory. The slurry having been consistently mixed it flows into another set of pressors and transmitted to the bins situated above the rotary kilns. By a special feeder the slurry is fed into the kilns. The kilns of the Shanghai Portland Cement Works are of a special type and design, having an enlarged sintering zone and the whole length of the Kiln is erected on floor level. This feature is especially interesting inasmuch as the Kiln of all other makes are erected on very high foundations in order to allow the cooling drums to be installed underneath them. Whereas the cooling drums of the Kilns of this Factory are attached to the ends which is the latest improvement. The slurry fed into these kilns is burned with pulverized coal, producing a heat of 1,500 degrees Celsius by which process clinker is formed. The clinker when cooled down in the attached cooling drums at the end of the kilns is conveyed to the clinker hall by means of shaking conveyors and elevators, going through at the same time an automatic weighing scale which registers the amount of production of each kiln. The Clinker Hall of this Factory has a storage capacity of 15,000 tons.

The coal required for the kilns for the production of clinker is pulverized and the process of pulverization is a separate process. The coal is carried into a grate receptacle and fed into an elevator which conveys it into an automatic weighing machine and is registered. From there it is sent into a bin above the drying drum which is heated with a special fire. The dried coal is sent to another bin from which the grinding mill is fed. This mill grinds the coal into very fine powder. The coal powder is conveyed, by elevators and worms, into storage bins above the kilns. This is fed into the kilns by high pressure fans which blow it into the sintering zone where it is exploded by the surrounding heat in the kiln. The



Air Compressor Room

quantity of coal powder to be fed into the kiln is controlled and registered by special mechanical devices

The clinker stored in the clinker hall is sent to the cement mill by shaking conveyors installed in the tunnel under the clinker hall. The conveyors receive the clinker from the clinker hall through special trap devices and it is carried up by an elevator and sent to a storage bin above the cement mill. Prior to the clinker entering the bin gypsum is added to it for the purpose of regulating the setting of the ground cement. For this purpose a gypsum crushing and distributing plant is installed between the clinker hall and the cement mill. The quantity of gypsum to be added varies according to the temper of the clinker and it is therefore regulated by the Laboratory When the clinker is sent to the cement mill by a special feeder the setting time of the cement to be produced is already determined. The cement mill is exactly similar in construction to the raw material grinding mill, namely a compound mill containing steel balls and flint stone with which the clinker is ground into fine cement. This is one of the most important sections of the factory, for the fineness of the cement depends upon the serviceability of the cement mill. Any cement mill will grind and grind the clinker to high fineness, but the problem is, will a cement mill grind to required fineness and required quantity per day's output at the same time ? The cement mill loses its function when it produces quality at the expense of quantity or vice versa. This is the point that some of the new cement factories have overlooked when ordering their machinery and this problem is facing them seriously to-day. When a cement mill is not efficient either quality or quantity must be sacrificed. The choice is of course whether the buyers or the manufacturers shall be the ultimate sufferers.

When the cement is ground it is sent to a special cement store or cement silos. It is conveyed from the mill by an elevator to the worm conveyers of about 82 metres in length. These conveyors feed the cement into an automatic weighing machine and from thence the cement is sent to the silos. The capacity of the silos of this factory is 25,000 barrels. Below each silo an automatic packing machine is installed. There are two barrel packing and three bag packing machines being provided. These machines are capable of filling 2,000 barrels and 3,000 bags in a day.

To prevent waste, the cement and coal mills are provided with dust collectors of special device called Beth filters. The dust thus collected is returned to the respective mills. For arresting the fine materials being blown out of the chimneys from the kilns, the smoke chambers situated between the heads of the kilns and the chimneys are provided with special arresting devices whereby all such dust is collected and returned to the slurry. One prominent cement engineer who visited the factory remarked that the works as well as the area around them were surprisingly free from dust !

The Power Plant

The whole factory uses electricity as its motive power. The power plant consists of one 2,000 h.p. M.A.N. turbine coupled with one 1,440 k.w., 50 cycles and 525 volts Siemens generator. The boiler room has an installation of five water tube boilers (Machinenfabrik Esslingen), each having a heating surface of 204 square metres, with super-heaters, mechanical grate stokers, suction draught plant, economizers, water cleaners and pumps. Coal is fed by electrically operated lifts. The boiler house being elevated the ashes are discharged through hoppers into the room below from where they are taken away on cars. There is also a Diesel generator of 80 k.w. to provide current for light and power during holidays. The factory has its own water installation. All the units of the factory are driven separately by electric motors.

The Barrel Shop

The factory has its own barrel shop capable of turning out 1,500 barrels per day. A complete set of machinery for the purpose has been installed. For consumers who prefer iron drums a set of drum making machinery and a welding plant are ready to meet requirements.

The Laboratory

A complete and up-to-date laboratory with highly trained European and Chinese experts controls the quality of the cement produced in the factory. The laboratory is equipped with apparatus for tensile, compression and chemical tests. Every ingredient that has to go to the factory for the manufacture of cement is first passed through the laboratory and it is accepted or rejected according to the tests. Very careful and painstaking tests are carried out hourly and records made. No cement is sent out to the market that escapes the watchful eye of the laboratory staff, so that the consumers can safely rely upon the quality of every bag or barrel of cement produced in the works the excellence of which the company claim.

General

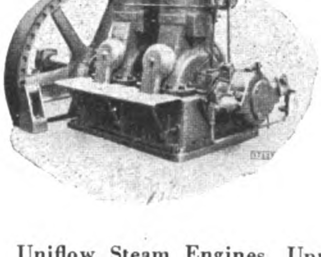
The building construction of the factory is of modern type. Owing to the nature of the soil the foundations both for the factory itself and the cement silos are of cement block type. A new and interesting feature of the construction was that all machinery was put up before the masonry work. The office buildings, residences for the manager, the engineer-in-chief and the staff are spacious modern buildings. The godown now in process of construction will have a storage capacity of 25,000 barrels. The two jetties for discharging raw materials and coal and also for loading cement are capable of taking care of half a million tons annually. These jetties can berth steamers of over 3,000 tons. The construction of the factory commenced in September, 1922 and was completed on July 18, 1923 on which date the works started to manufacture cement. It took the record time of ten months to complete the whole construction, a fact in which the company take just pride.

The whole factory is built with provisions for extension from 1,400 barrels per day which is the present capacity of output to 2,800 barrels per day. Investigation showed that only seventy-eight workmen are employed in the factory and when one has known other factories of similar nature which employ twelve times the number of labourers, one at once begins to appreciate the modernness of this factory. And this is the factory situated in Shanghai which is sending out daily hundreds of barrels of cement bearing the label of an elephant whose quality the officials claim is equal, if not actually excels, the Holderbank output.

SULZER BROTHERS

SHANGHAI ENGINEERING OFFICE
No. 4 AVE. EDWARD VII

蘇爾壽工程事務所
上海愛多亞路四號



Airless Injection Two Cycle Sulzer Diesel Engines

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WINTERTHUR. SWITZERLAND.

Cane Sugar and Distilling Industry in Indo-China*

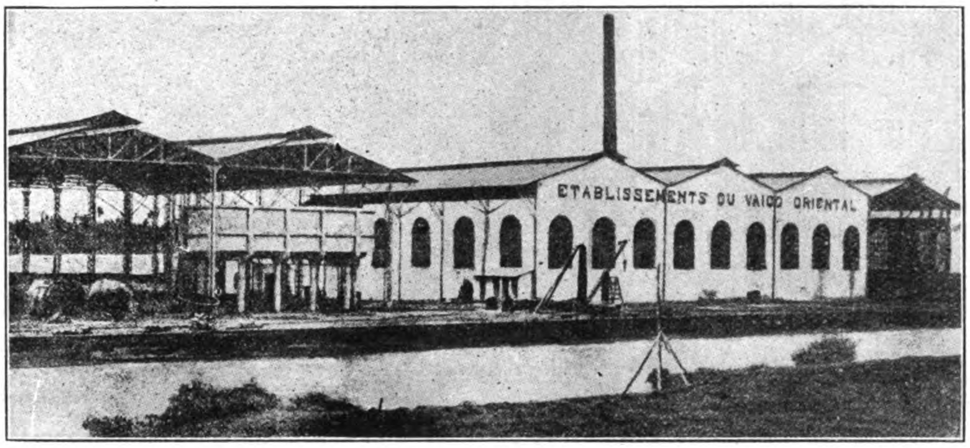
By J. Ruet

THOUGH sugar cane has been grown for ages in Indo-China, sugar making is quite a recent industry which began some fifty years ago and especially developed in Cochin-China and Annam where the total areas covered by cane are 13,000 and 27,000 acres respectively.

The average yearly production has been for the last decade 40,000 tons of Muscovado sugar for all the sugar produced until 1917 was only manufactured by native factories, if we dare call a factory the small wooden mill and other implements used.

The yield per acre is very low and the maximum obtained has been 1.5 ton of sugar ; this is firstly due to the cultivation process of the natives who hardly make use of fertilizers the only one being a mixture of chalk and ashes of paddy husks. Secondly the mill which is composed of three vertical wooden cylinders, about three feet high by one foot diameter gives a very poor juice extraction about 45 per cent., which is really nothing when compared with the 98.7 per cent. obtained in Hawaii.

Further the evaporation system consists of three or four cast iron pans on a single furnace in which bagasse or wood is burned. The juice is allowed to remain in these pans for an hour or two after which it is clarified with chalk and goes through the defecation process.



The Vaico Oriental Sugar Factory at Cholen, Cochin-China

The boilers used are the same pans in which the syrup is stirred in order to help the crystallization and formation of the massecuite, which, while still boiling hot is poured over mats in thin layers and allowed to cool. The sugar is then ready to be sold.

Such mills, in spite of their poor efficiency, manufacture an average of 200 kilos per 12 hours and more surprising still give considerable profit.

Two-thirds of the total production of Indo-China is used locally by the natives, the other third is exported to China which shows a great increase in this line if we consider that in 1914 only 2,500 tons were the needs of the Chinese dealers.

To these 40,000 tons of muscovado sugar we must add 1,000 tons of white sugar produced by the Vaico Oriental Factory (Cochin-China) which was erected in 1917 ; but this quantity is far from being sufficient for the local needs for besides it the colony has to import each year 9,000 tons of white sugar from France, Hongkong and Java.

A new company the " Société Sucrière Franco-Japonaise " has just been incorporated in Saigon for the erection of a factory which is expected to turn out 1,000 tons of white sugar per year, it will be located in the province of Bienhoa (Cochin-China).

All this data sufficiently proves the necessity of building modern factories which not only with a better extraction will increase the actual production by two-thirds, but also with appropriate scientific methods of cultivation will class French Indo-China in a few years time among the world's sugar-producing countries.

Growth of Alcohol Industry

More than thirty years ago a plant was laid down under the name of the Société Française de Distilleries d'Indo-Chine in the outskirts of Cholon, the industrial part of Saigon, for the purpose of producing alcohol from paddy. The plant occupied just a small area on a marshy piece of land and was due to the initiative of a single man, M. Fontaine. When the factory was completed it was capable of an output of 20,000 hectolitres per annum.

In 1908 the annual output had been increased to 100,000 hectolitres as a result of the addition of new buildings. Up to this time the factory was dependent on the neighboring mills for the supply of the rice required but with this increase it was decided that the factory should have its own rice mill and in 1912 a plant was laid down for the production of the 30,000 tons of rice required. This was built on the most modern principles and was a vast improvement on the other mills of the district whose building dated some twenty years back. These improvements were completed before the outbreak of war and so it happened that in spite of the reduced tonnage available for freight the company was able to send to France over 100,000 hectolitres of alcohol and vast quantities of acetone for use in the making of explosives and for the aircraft trade. This was in addition to the production turned out for local consumption.

Not the least interesting point in the growth of this factory is the fact that it has become more and more self-contained and has contrived to make use of its by-products to the utmost limits. It is significant that only on commodity enters the factory and this is the unhulled rice or paddy brought straight from the producers. The waste product after the rice has been milled is made use of for heating the boilers of the steam engines and these engines furnish the power for the electric motors driving all the machinery of the plant. The rice once milled is turned over to the distillation process and to the plants treating the by-products. In 1921 new buildings were again started and have now been completed for making further use of these. One of the new buildings and plant is for the purpose of obtaining the oil contained and to make soap which will be a new source of prosperity for the company. Another is for the production of concentrated foodstuffs from flour which undergoes fermentation process. It is contemplated that these articles will reach the home market first meeting local needs.

All the while the plant is extending ; laboratories and repair shops have grown up. A new rice mill has just been added capable of producing 300 tons daily. To give a comprehensive idea of the growth of this factory a few figures will not be amiss. The European staff of chemists, engineers, etc., numbers fifteen, the workmen number eight hundred. Covered sheds over some 20,000 squars maters have been built for storage purposes. The production of alcohol has now reached 10,000 litres per day. In reviewing the growth of this industry which from such small beginnings has now reached to such prosperity one cannot help admiring the spirit of enterprise and perseverance which has animated the founders of the company. In conclusion it is a pleasure to note that the laboratories of the plant have been studying the terrible scourge of beri-beri and that the new food products we have spoken of will be a useful remedy against the ravages of this terrible disease.

*Information de l'Extreme Orient.

New Hongkong Hotel

WE reproduce from *The Hongkong Telegraph* the sketch of a large modern hotel which it is proposed to erect on the Praya, on the corner of Morrison Street—an establishment which is intended to cater for tourists and others passing through the colony and visiting Canton and Macao. This new hotel, to be known as "Empress Hotel" and which will be one of the most elaborately fitted and equipped hotels in the Far East, has been purposely located adjacent to the wharves of the Canton and Macao steamboats and, as will be found detailed below, will be replete with every comfort and necessity attractive to hotel patrons. Standing on a site of 8,000 square feet, and having frontages of Des Voeux Road and the Praya, as well as on Morrison Street, the new building will be seven stories high, and will be a predominating landmark on the waterfront.

The height of the building will be 105 feet to the level of the roof garden and it will contain 140 bedrooms and 60 bathrooms. On the ground floor will be situated the public lounge, shops and a garage, whilst the first floor will be totally occupied by a spacious dining room (with table and seating accommodation for over 200 diners) and ball room, together with the necessary ante-rooms and service arrangements. Modern kitchens and pantries will be situated on mezzanine floors at the rear of the building. The plan has been so arranged that the dining room and ballroom will have direct ceiling light through artistic leaded glass domes at the second floor level.

It is the interior decorations that will make the lounge, dining room and ballroom distinctive and noteworthy. The decorations of the lounge will be carried out in fibrous plaster in Neo-Greek style, with electric standards and chandeliers to harmonise. The floor of the lounge will be of Italian marble, as will also be the grand staircase from the ground floor to the dining and ball rooms. The dining room will be in modern English Renaissance style with wall panels of tapestry—reproductions of famous English masterpieces. The whole scheme of walls and ceiling will be carried out in fibrous plaster. The ball room will be somewhat similar in character, with Chinese mural scrolls taking the place of the tapestries in the dining room. The floors of both rooms will be of parquet teak wood and blackwood, the furnishings and lighting equipment being of outstanding character.

The five top floors are given over entirely to single and double bedrooms, etc., these being of typical modern American design. Modern sanitary arrangements will be fitted throughout the building. Regarding the roof garden, an effort is being made to provide very attractive addition to the hotel's amenities. On every bedroom floor will be situated service pantries and offices, the upper floors of the building being served by three main passenger lifts, a wide stairway and fire escapes.

The windows will be metal casement throughout. Regarding the exterior finish of the building, this will be of granite facing from the ground level to the second floor window sill level, the remainder of the building, with the exception of the main columns, being faced with special matt-surfaced tiles of a pleasing green shade. The structural part of the building will be of reinforced concrete throughout.

Contracts have been signed and the work has already been put in hand, Messrs. Lam, Dore & Co. being the contractors. It is hoped to have the hotel ready for occupation by October, 1925.

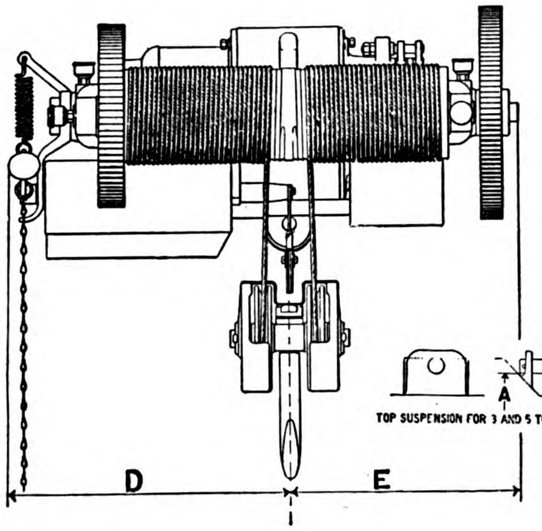
We are indebted to Messrs. Palmer and Turner, the architects, for the above sketch and description of the building, which was designed by Mr. A. G. W. Ogilvie, under whose supervision the work is to be carried out.

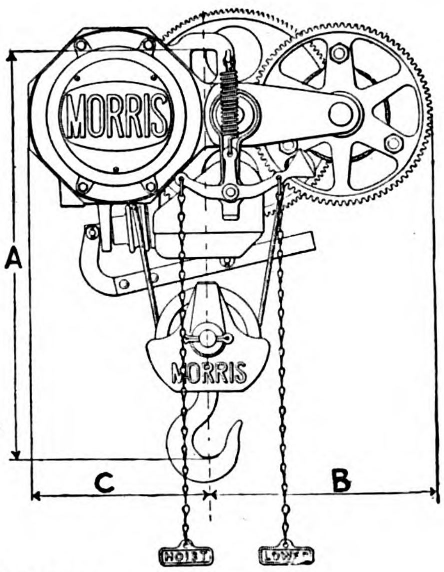
Radio-Phones on S. M. Railway

Technical experts of the South Manchurian Railway are testing out wireless telephone apparatus with the view to applying this means of communication to the operation of trains and to that end are planning installations to be placed at the principal railway stations of the line as well as on the trains themselves. The present plan considers only those stations in the Kwantung Leased Territory since, outside this area, Chinese consent would have to be obtained to such wireless operations, which might be hard to obtain.

Mica Concession Granted

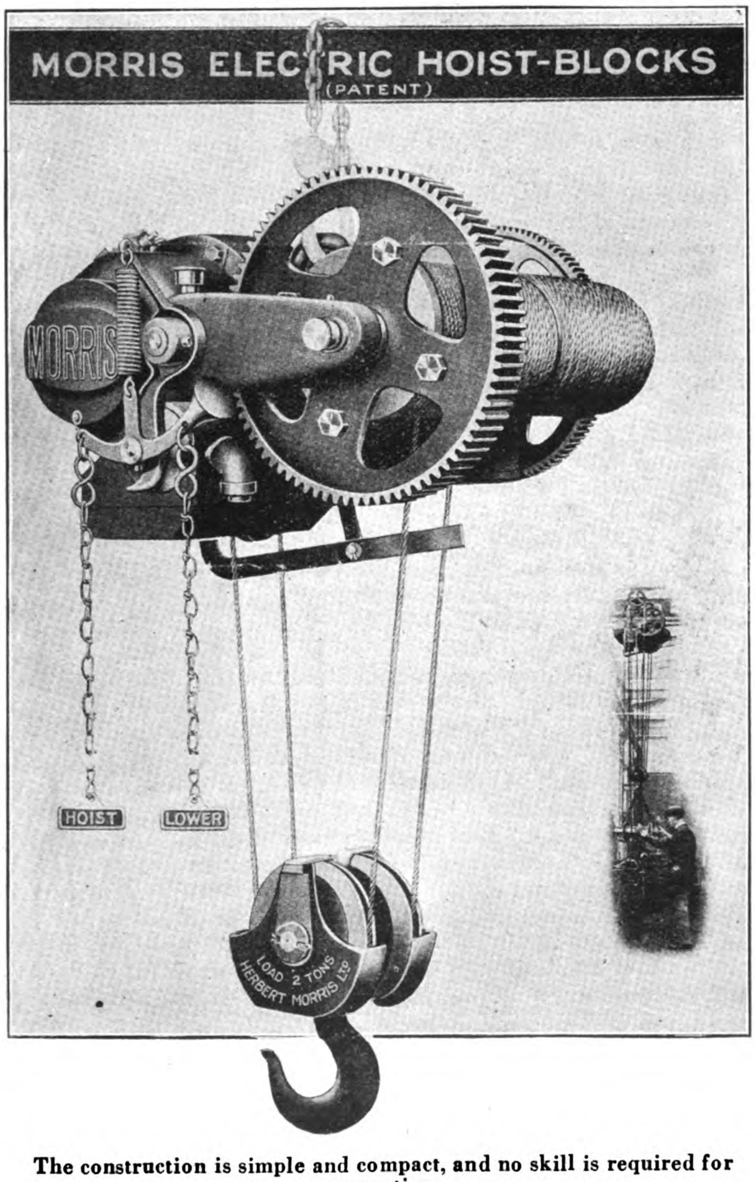
According to Moscow dispatches an agreement has been signed by the Soviet Concessions Committee with A. Grossbard, of New York, representing the International Mica Co. This concession is reported to confer exclusive rights to work the mica beds in the Siberian fields 600 miles north of Irkutsk and covers an area of 240 square miles near the Lena goldfields. Owing to the rapid extension of the electrical industry in which mica is so largely used as an insulator, this concession is considered to be extremely valuable





GENERAL PARTICULARS

Working Load		$\frac{1}{2}$ Ton	1 Ton	2 Tons	3 Tons	5 Tons
Tested to		$\frac{3}{4}$ Ton	$1\frac{1}{2}$ Tons	3 Tons	$4\frac{1}{2}$ Tons	$7\frac{1}{2}$ Tons
Dimensious { A is minimum drawn-up-dimensions. The maximum clear lift is 20-ft.	A	1′ 3″	1′ 11′	2′ 3″	2′ 8″	3′ 2″
	B	11″	1′ 2″	1′ 6″	1′ 9″	2′ 2″
	C	9″	11″″	1′ 1″	1′ 2″	1′ 5″
	D	11″	1′ 5″	1′ 6″	1′ 11″	1′ 11″
	E	10″	1″ 4″	1′ 6″	1′ 7″	1′ 9″
Hoisting Speed, full load *in feet per minute*		22	20	20	18	15



The construction is simple and compact, and no skill is required for operation

The Morris Electric Hoist-block

THIS high-grade tool built for wear and service and to the highest specifications is, according to its manufacturers, the simplest, most compact and most efficient on the market. The motor is part and parcel of the main frame and the brakes are automatic in action and because of the skilful disposition of the parts are all accessible and easily dismantled. The gears are spur-gears and all machine cut. It is also fool-proof. The magnetic brake sustains the load in any position and the governor automatically prevents acceleration beyond a pre-determined safe limit with any load on the hook. The over-winding switch automatically cuts off the current should the operator negligently attempt to hoist too high. These electric hoist-blocks are invaluable for a number of purposes. They may be used as stationary hoists or hung in trolleys on an overhead runway or crane-girders.

When used entirely as a stationary unit the current can be supplied by means of a flexible cable from some convenient point in the main. If required to work at different points, wall sockets may be fixed at the selected situations, and the supply cable plugged in where desired.

Working as a traveling hoist-block, the runway or crane-girder is wired, and the trolley fitted with collectors to pick up current in any position. The traveling motion can be by hand or electricity, as required. The motor is totally enclosed, and is specially designed and constructed for hoist duty. When working with A.C. current it is of the slip-ring type.

The controller is of the reversing drum type, also totally enclosed, and fitted with automatic fly-back release and renewable contacts. The frame is a one-piece steel casting, comprising the magnetic circuit of motor, the bearings (brass bushed) of the intermediate shaft, and the drumshaft supports; and is machined to jigs, ensuring accuracy and permanence of alignment.

The load is lifted on four parts of best extra-special-flexible plough-steel wirerope working in a grooved drum, giving a truly vertical lift. The hook is a steel forging, and swivels on ball-bearings.

Tunnel Borers Finish Eight Years Work

One of the most difficult engineering feats in Japanese railway construction has just been brought to successful conclusion in the opening of the Orito tunnel on the Aomori-Shimonoseki direct line, the second great trunk railway of Japan. This tunnel is a mile long and has taken eight years of arduous work to bore due to many new engineering problems that constantly had to be solved. Together with the completion of the section between Murakami and Atsumi, this tunnel will shorten the distance between Aomori and Osaka by 150 miles.

It is expected that the entire line will be open for traffic before the end of July and it will constitute not only one of the most useful from a commercial standpoint, but is considered absolutely indispensable from a military one. It has cost nearly Y.100,000,000, but gives a more direct route from the northern to the southern end of Hondo and forming a new connecting link between many important ports and cities of the northern and western districts of the island, serving especially the districts along the shore line.

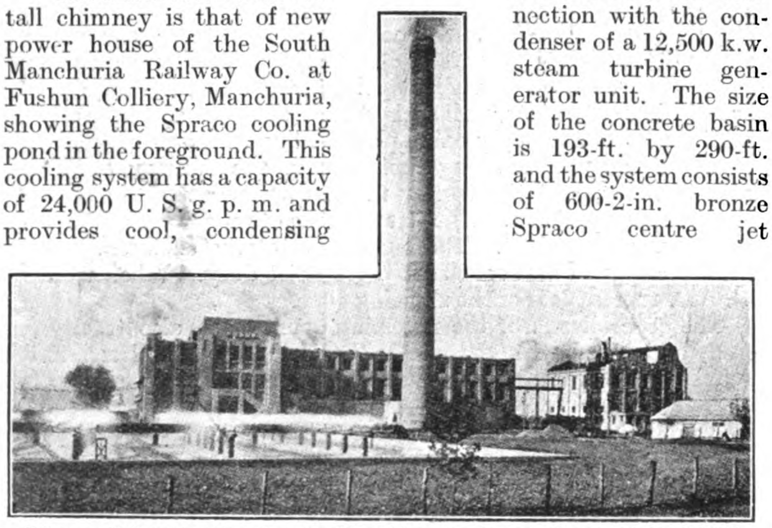
The tunnel has not been the only difficult bit of engineering on this line, since the Murakami-Atsumi section has called into play all the ingenuity of the construction forces of the northern district. In less than two months the construction forces will turn over the finished section to the operating officials after many years of arduous work.

"Spraco" Water Cooling System in China

THE problem of obtaining cool condensed water for power plants in China is being solved through the installation of the Spraco cooling ponds furnished by the Spray Engineering Company of Boston. Amongst the many plants which have this system installed are the following:—

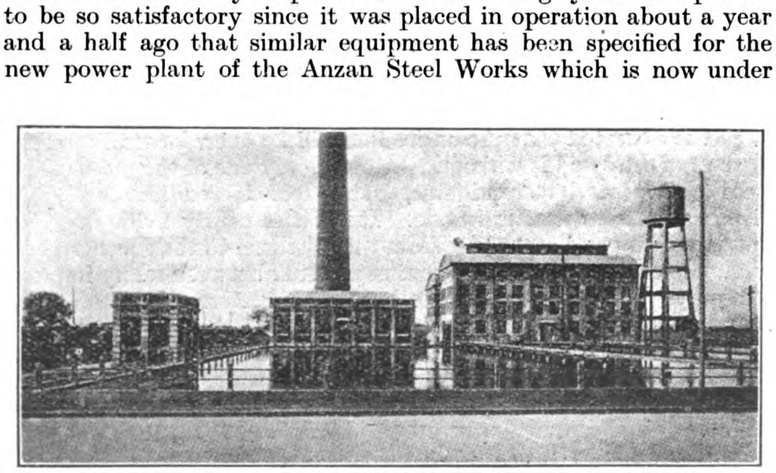
	U. S. g. p. m.
Cheng Chow Textile Mill, Cheng Chow	1,920
Cheng Chow Textile Mill, Cheng Chow	2,880
Cheng Chow Textile Mill, Cheng Chow	2,400
Kirin Electric Light Company, Dalny	1,500
Macao Electric Lighting Co., Ltd., Macao ..	112
Mukden Electric Light Co., Mukden, Manchuria	3,200
Mukden Government Cotton Mill, Mukden, Manchuria	2,560
Taiyuanfu Electric Light Co., Tai Yuanfu ..	800
Tunglioachen Electric Light Works, Mukden, Manchuria	480
Wah Chang Trading Corp., Shanghai	5,200

The illustration with the tall chimney is that of new power house of the South Manchuria Railway Co. at Fushun Colliery, Manchuria, showing the Spraco cooling pond in the foreground. This cooling system has a capacity of 24,000 U. S. g. p. m. and provides cool, condensing water for use in connection with the condenser of a 12,500 k.w. steam turbine generator unit. The size of the concrete basin is 193-ft. by 290-ft. and the system consists of 600-2-in. bronze Spraco centre jet



"Spraco" Cooling Pond at the New Fushun Power House of the S.M.R.

nozzles arranged in groups of five each with complete system of cast iron flanged piping varying from 30-in. down to 4-in. diameter. The total weight of the system is 140,000-lbs. In connection with this system there are two centrifugal pumps each having a capacity of 24,000 U. S. g. p. m. direct connected to 250 h.p. electric motors. The ratio of circulating water to steam condensed is 70 to 1 thereby enabling a vacuum of 28-in. referred to a 30-in. barometer to be maintained when the atmospheric temperature is 80° F. and the relative humidity 60 per cent. This cooling system has proved to be so satisfactory since it was placed in operation about a year and a half ago that similar equipment has been specified for the new power plant of the Anzan Steel Works which is now under



"Spraco" Cooling System at the Dah Shing Cotton Mill, Shikiachwang

consideration. The power plant equipment was purchased and installed by Mitsui & Co., Tokyo, through their New York office.

The second illustration which does not show the entire height of the chimney is the power plant mill buildings of the Dah Shing Cotton Mill, Shia Kai Chong, China. The photograph shows a very large concrete basin especially for the Spraco cooling system, two sections of which not in operation are seen on the right hand side of the illustration. A third section has just been purchased through the Wah Chang Trading Corp., Shanghai, by their New York office having a capacity of 2,600 U. S. g. p. m. making the present capacity 7,800 g. p. m. which is sufficient to take care of 4,000 k.w. of steam turbine generators.

American Trading Company

PERCY H. Jennings, president of the American Trading Co., and William E. Peck, president of William E. Peck & Co., announced recently in New York that a consolidation of the two houses, engaged for years in export and import business, will take place upon ratification by the stockholders of each of a plan of merger proposed by the board of directors and management of each of these companies. The New York corporation will be called the American Trading Co., Inc.

It will have a working capital of about $5,000,000. The authorized capital stock will be divided into shares as follows: 25,000 shares prior preference ($100 per 8 per cent. cumulative); 50,000 shares preferred (non-par $8 non-cumulative); 75,000 shares common (non-par).

The consolidated business of both companies for the year 1923 amounted to approximately $45,000,000, which is about twice the annual volume of the companies' business for the years preceding the war.

The American Trading Co., the larger of the two companies, has a history dating back to 1857 and its development has been through growth and through consolidation with other long established export and import concerns. It is a pioneer in the export of American manufactured goods and throughout its existence has been one of the foremost in the development of this particular branch of business.

William E. Peck & Co., Inc., was founded by William E. Peck in 1881 and it, too, has grown through individual development and also through consolidation with other well established companies in the same line of business. This company had its origin primarily as a distributor of American manufactured goods in foreign markets and most of the original agencies for American manufacturers are still held by it and form the back-bone of its business to-day.

The board of directors, as proposed for the new company, will include:

George S. Brewster, of New York; Robert S. Brewster, of New York; Mortimer N. Buckner, chairman of the board, the New York Trust Co.; George S. Franklin, of the firm of Cotton & Franklin, New York; Walter S. Franklin, vice-president and secretary of American Trading Co.; Oliver G. Jennings, of New York; Percy H. Jennings, president of American Trading Co.; Hall Park McCullough, of the firm of Stetson, Jennings, Russell & Davis, New York; William E. Peck, president of William E. Peck & Co., Inc., who will become a vice-president of the new company; Gardner B. Perry, vice-president and treasurer of American Trading Co.; Lansing P. Reed, of the firm of Stetson, Jennings, Russell & Davis, New York; Edward M. Sutliff, vice-president of American Trading Co.; Arthur H. Titus, president First Federal Foreign Banking Association, New York; Daniel Warren, vice-president of American Trading Co.; George M. Woolsey, of New York.

The new company will be strongly entrenched in the following markets: United States and Canada, England, the Continent and Scandinavia, Japan, China, Australia, New Zealand, the Straits Settlements, South Africa, Cuba, Mexico, Argentina, Brazil and the other Central and South American countries.

Through the medium of the offices in the United States American staple commodities and manufactured goods continue to be exported to all parts of the world, and in like manner the products of foreign countries imported for distribution in the United States and other countries.

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

GOING BACK TO PORTSMOUTH

A CONSPIRACY OF SILENCE

THE STATUS OF THE CHINESE RAILWAY

THE BASIS OF AN HONORABLE SOLUTION TO MANCHURIAN PROBLEMS

MILLIONS FOR ADVERTISING TEA

MONGOLIA, A SORRY PICTURE

SHANGHAI SEWERAGE

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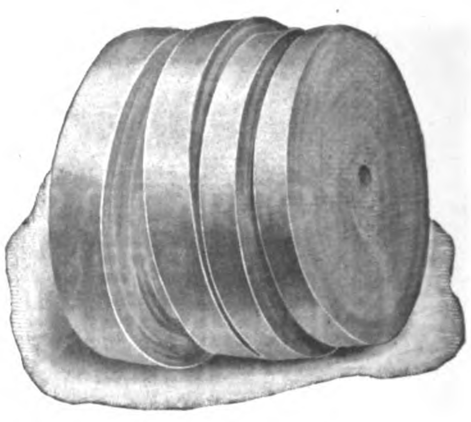

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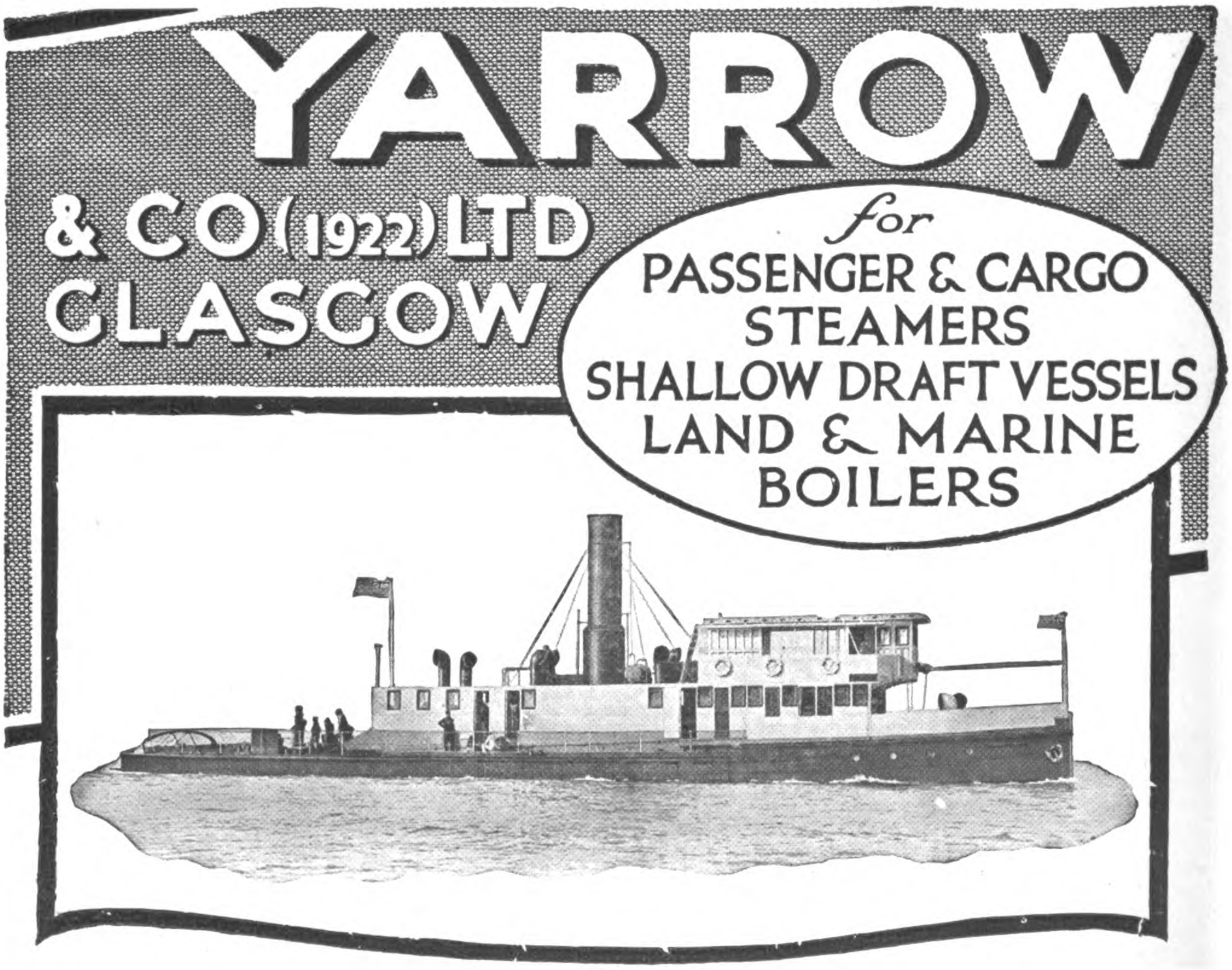


The Far Eastern Review

ENGINEERING FINANCE COMMERCE

Vol. XX SHANGHAI, JUNE, 1924 No. 6

Going Back to Portsmouth

A CONSPIRACY OF SILENCE

By Geo. Bronson Rea

Further Reflections on Basic Far Eastern Problems After Reading a Book Entitled "Conflict of Policies in Asia" by Thomas F. Millard, Published by the Century Company of New York

MR. THOMAS F. MILLARD has written another book. This time he entitles it "Conflicts of Policies in Asia" but after a careful perusal of its contents we come to the conclusion that the conflicts are largely the result of clashes of undigested ideas in the mind of the author. At least half of the book is devoted to the publication of "confidential" memoranda written by Mr. Millard on every conceivable phase of Far Eastern problems, leaving the impression in the mind of the reader that American and Chinese state policies have been largely moulded and directed by this brilliant super-strategist whose chief aim in life seems to have been to embroil his own country in a war with Japan.

Mr. Millard is a self-confessed authority on Far Eastern affairs. He modestly admits this fact in several places in his new book and if he is taken seriously it would seem that his advice has been eagerly sought by American and Chinese statesmen to an extent which places him head and shoulders above all other experts in these problems. After reading the mass of confidential information covering every conceivable political, economical and strategical contingency in the Far East, we begin to realize how utterly insignificant are all other authorities on these subjects. It was only a few months ago that we reviewed a book written by Professor E. T. Williams, the official Far Eastern expert to the American government and condemned as worthless the chapters on international politics because he omitted the main evidence on which modern Far Eastern history should be based. We refer specifically to the Sino-Russian secret treaty of alliance of 1896 revealed officially for the first time by China at the Washington conference.

We remarked at the time that there existed a conspiracy of silence on the part of American and British writers concerning the existence of this important document, for if once emphasized, the sequence of events would vindicate Japan's policies in China and undermine the foundations of American policy in the Far East. Three American experts have written books on China since the Washington conference, yet with the records before them, ignored any mention of the evidence disclosed at that conference which would have given the world the proper perspective on Far Eastern problems. Mr. W. W. Willoughby, adviser to the Chinese government, published a very exhaustive report on "*China at the Conference*" faithfully covering all phases of the questions raised but rejecting the most important. Mr. E. T. Williams, the expert of the American government, did likewise. Now comes Mr. Thomas F. Millard and commits the same unpardonable error.

Mr. Millard gives the origins of the Manchuria question, as embraced in another of his numerous confidential memoranda to the Washington conference. He says "*Manchuria belonged to China: a condition which required the Russian government to negotiate a treaty with China for a railway right-of-way there. Such a secret treaty was negotiated in 1895 and came into effect in the following year. It took the form of an agreement between a Russian corporation, the Russo-Chinese Bank (created for the purpose) and the Chinese government, whereby the Chinese Eastern Railway was to be built.*" He then builds up his argument from the provisions of the railway agreement, but not one word about the objects or the provisions of the master treaty which preceded it. Neither in the text of his book or in its appendices does he quote that secret treaty of alliance.

Mr. Millard is either ignorant or careless. In the first place, the secret treaty was signed in May 1896, not in 1895. This, however, may be a typographical error, but nevertheless the oversight is proof of the slipshod manner in which Mr. Millard marshalls his facts and then distorts them to support his perverted ideas on the situation. There is absolutely no excuse for him to ignore the filing and the text of the treaty. In Appendix H of his book he quotes from Professor Willoughby's report on the conference giving the tentative list of inter-power agreements that had been entered into with reference to China and which China desired to have cancelled. We mention this as it leads us to believe that Mr. Millard scrupulously avoided a study of the official minutes of the conference on the limitation of armament issued by the government printing bureau at Washington. Professor Willoughby took the above information from page 1152 of this document and Mr. Millard took his from Professor Willoughby. If Mr. Millard had examined the official record he would have found on page 1414 the telegraphic summary of the treaty of alliance between China and Russia (May 1896) submitted by the Chinese delegation. He would also have noted that the Chinese delegates promised that they would send a copy of the full text of the treaty as soon as it was received, and he would also have noted that the official record makes no further reference to the treaty, by which it is to be inferred, the Chinese failed to carry out their promise.

Now it is a remarkable fact that notwithstanding the irrefutable evidence concerning the existence and object of this master treaty, not one American expert on Far Eastern affairs has been honorable enough to quote or draw deductions from it. In feigning ignorance of its importance and suppressing vital evidence concerning grave international issues and at the same time carrying on a propaganda calculated to create animosities and stir up strife a journalistic crime is committed that merits the severest condemnation. It is within our knowledge that the American state department is fully aware of the vital significance of this document; that official reports have been submitted to the government which fully support our own contentions that this is the key to the Chinese puzzle, the lid of the Pandora box the opening of which brought death to hundreds of thousands, bankrupted Japan and started China on the road to ruin.

Mr. Millard fully understands the gravity of ignoring the existence of treaties having a vital bearing on delicate international issues for in commenting on the deplorable truth that the American

Delegation went to the Paris peace conference in complete ignorance of the secret agreements between the other allied powers relating to China, he says :

"Without implying that President Wilson and Secretary of State Lansing must have known before they went to Paris about the Shantung and other interallied secret agreements, it can be demonstrated that they ought to have known. Some of the secret agreements had been published (not those about Shantung), and the existence of the Shantung agreements had been distinctly intimated by the agreements that were published. Most commentators assert, from a survey of the circumstances, that if President Wilson and Mr. Lansing did not know officially (that is, by being officially informed) of the secret treaties before they went to Paris, they must have known of them unofficially. Certainly there was sufficient ground for suspicion that such agreements existed for the American government, when it entered the war, to have made definite inquiries and to have insisted on definite answers. For the American government to have gone through the war and to have entered upon negotiations for peace lacking that information is, to say the least, a striking case of ineptitude."

We concur in this. It was the most striking case of official ineptitude in a long series of diplomatic blunders characterizing the Wilson administration. If the failure of the state department to unearth these facts is open to such severe criticism what is to be said of the expert who, with the official record before him, writes a serious book and deliberately suppresses the evidence which overturns his ponderous theories ? At least, there is some excuse for the government. Official ineptitude in this case can be laid to the door of an inadequate intelligence service which was hastily organized after the entrance of America into the war and staffed by men in the main sadly deficient in the rudimentary requirements of intelligence work, but there is no palliating excuse for one who poses as the chief American expert on Far Eastern affairs in overlooking a piece of evidence which the veriest tyro in our intelligence departments would have sensed as vital. To plead ignorance of the 1896 Sino-Russian treaty of alliance and its bearing on subsequent Far Eastern history is a frank confession of incompetency to discuss these problems while to utterly ignore it as having no bearing on the issues involved is a brazen acknowledgement of partisan pleading which places the author outside the pale of honorable journalism.

It is pure folly at this late date for any writer on Far Eastern affairs to commence his story with a railway agreement which is now officially accepted as the instrument which carried into effect the terms of an alliance aimed at Japan. It is significant that the Chinese delegation at Washington filed only a brief telegraphic resume of this document with the conference. Only by comparing this summary with the full text as disclosed by other authorities can we understand the reluctance of the Chinese to set forth in full the terms of an alliance which makes their country the full partner of Russia in provoking one of the most disastrous wars of history. Once more, we call attention to the text of the treaty as given in the official records of the conference on page 1414.

"Article 1.—The high contracting parties engage to support each other reciprocally by all their land and sea forces in case of any aggression directed by Japan against Russian territory in Eastern Asia, China and Korea.

"Article 2.—No treaty of peace with an adverse party can be concluded by either of them without the consent of the other.

"Article 3.—During military operations all Chinese ports shall be open to Russian vessels.

"Article 4.—The Chinese government consents to the construction of a railway across the province of Amur and Kirin in the direction of Vladivostock. The construction and exploitation of this railway shall be accorded to the Russo-Chinese Bank. The contract shall be concluded between the Chinese minister at St. Petersburg and the Russo-Chinese Bank.

"Article 5.—In time of war Russia shall have free use of the railway for the transport and provisioning of her troops. In time of peace Russia shall have the same right for the transit of her troops and provisions.

"Article 6.—The present treaty shall come into force from the day on which the contract stipulated in Article 4 shall have been confirmed. It shall have force for fifteen years."

Let us compare this with the version given in McMurray's compilation of *Treaties and Agreements with and Concerning China.* On page 81, we find the following :—

"In an article entitled 'Manchuria—A Chinese View of the Situation' by 'An Admirer of Li Hung Chang,' which was published in the London *Daily Telegraph* of February 15, 1910, it was stated that while attending the Coronation ceremonies of Emperor Nicholas at Moscow, in May, 1896, Li Hung Chang concluded with the Russian minister for foreign affairs (Prince Lobanoff-Rostovsky) a secret treaty of alliance, the French text of which was given together with the following English translation :—

"'TREATY OF ALLIANCE BETWEEN CHINA AND RUSSIA. May 1896.

"'Article 1.—Every aggression directed by Japan, whether against Russian territory in Eastern Asia, or against the territory of China or that of Korea, shall be regarded as necessarily bringing about the immediate application of the present treaty.

"'In this case the two high contracting parties engage to support each other reciprocally by all the land and sea forces of which they can dispose at that moment, and to assist each other as much as possible for the victualling of their respective forces.

"'Article II.—As soon as the two high contracting parties shall be engaged in common action no treaty of peace with the adverse party can be concluded by one of them without the assent of the other.

"'Article III.—During the military operations all the ports of China shall, in case of necessity, be open to Russian warships, which shall find there on the part of the Chinese authorities all the assistance of which they may stand in need.

"'Article IV.—In order to facilitate the access of the Russian land troops to the menaced points, and to ensure their means of subsistence, the Chinese government consents to the construction of a railway line across the Chinese provinces of the Amour (i.e., Heilungkiang) and of Guirin (Kirin) in the direction of Vladivostok. The junction of this railway with the Russian railway shall not serve as a pretext for any encroachment on Chinese territory nor for any infringement of the rights of sovereignty of his majesty the emperor of China. The construction and exploitation of this railway shall be accorded to the Russo-Chinese Bank, and the clauses of the contract which shall be concluded for this purpose shall be duly discussed between the Chinese minister in St. Petersburg and the Russo-Chinese Bank.

"'Article V.—It is understood that in time of war, as indicated in Article I, Russia shall have the free use of the railway mentioned in Article IV, for the transport and provisioning of her troops. In time of peace Russia shall have the same right for the transit of her troops and stores, with stoppage, which shall not be justified by any other motive than the needs of the transport service.

"'Article VI.—The present treaty shall come into force on the day when the contract stipulated in Article IV, shall have been confirmed by his majesty the emperor of China. It shall have from then force and value for a period of fifteen years. Six months before the expiration of this term the two high contracting parties shall deliberate concerning the prolongation of this treaty.'

"The substantial accuracy of the disclosure thus made would appear to be adequately confirmed by the following extract translated from *Ma Mission en Chine* : 1893-1897 (Paris, Plon-Nourrit, 1918), by M. A. Gérard, who during the period indicated was French minister to China :

"Although the treaty was intended to remain secret, I one day had in my hands for a few minutes, during a visit which I made in the spring of 1897 to Li Hung Chang at his residence in Peking, the copy of the document which he had signed the previous year with Prince Lobanoff. The English translation of this text was published fifteen years later, when the treaty itself had expired, in the London *Daily Telegraph*, by the son of Li Hung Chang, Li Ching Mai, who was then Chinese minister at the court of St. James, and who sought to defend his father's memory against unjust attacks. The treaty was in fact a treaty of alliance, concluded for a period of fifteen years, by which the Chinese government obligated itself, in the event of an aggression by Japan, to place at the disposal of the Russian government its ports and all means of defence. The principal clause of the treaty was the assent given by the Chinese government to the construction and operation, in the Manchurian provinces of Amur (Heilungkiang) and Kirin, of a line of railway connecting with the Russian Siberian lines, the concession for which was made to the Russo-Chinese Bank by a contract to be signed between the Chinese minister at St. Petersburg and the delegate of the Bank

(Article IV). It was stipulated in Article VI that the treaty should come into force on the day on which the contract for the construction and operation of the railway should have been approved and ratified by the emperor of China. . . .

"The English newspapers at Shanghai had published, long before it was signed, the alleged text of the treaty and of the contract. They published another so-called version in the month of October, 1896, some days after the ratification at Peking of the contract in regard to the railway. These various texts, to which the English press gave the name of the 'Cassini Convention,' were apocryphal. They confused the treaty of alliance, properly so called, with the railway contract. . . . The true facts as here outlined establish that there never was, properly speaking, any 'Cassini Convention'; that the treaty of alliance was concluded at St. Petersburg in the month of May, 1896, between Li Hung Chang and Prince Lobanoff; that the railway contract was signed on September 8 following, also at St. Petersburg, by the Chinese minister, Shu Ching Cheng, and the delegates of the Russo-Asiatic Bank; and that it was this contract for whose definite ratification at Peking on September 30 Count Cassini waited before proceeding on his way to Russia."

The full version of the treaty leaves no room for doubt as to its purposes. Outwardly defensive in its opening paragraph it develops rapidly into an offensive arrangement which brought Russia into a position in Manchuria in order to drive the Japanese from Korea. In pursuance of its object and to facilitate the transport of Russian troops to the "menaced points" and to assure an uninterrupted line of military supplies, the Chinese government ceded to Russia the right to construct the Chinese Eastern Railway and surrendered its sovereignty over the railway zone. Later, in 1898, the concession and juridical rights were extended to cover a branch line from Harbin to Port Arthur and at the same time China presented her ally with a naval base at the latter point and gave her a lease to the Liaotung peninsula for twenty-five years. It all followed the original program laid down at St. Petersburg between Li Hung-chang and the Russian authorities. China's principal part in the alliance was to surrender her territory to the stronger military power. This she faithfully carried out before there could be any technical question as to the annulation of the treaty by Russia's participation in the Boxer campaign of 1900. China lived up to her end of the bargain and precipitated the Russo-Japanese war eight years later. These facts challenge refutation. They were available to Mr. Thomas F. Millard but in order to save himself and his previous books on Far Eastern questions from being discredited he persists in suppressing the truth.

* * *

Forcing the Issue

Unless all signs fail the time is not far distant when the world must give heed to the Sino-Russian treaty of 1896, that master piece of secret diplomacy which precipitated the spoliation of China, forced the Anglo-Japanese alliance, the battle of concessions of 1900, the declaration of the "open door" doctrine and the Russo-Japanese war. The conspiracy of silence will be broken when swift moving events compel Japan to fall back on the provisions of this pact and in the light of all that it implies and all that followed as a consequence thereof, demand a re-opening of the entire Manchurian question as the only way to bring about its peaceful and permanent solution. The recent recognition of Russia by China and the former's repudiation of all treaties concluded under the old Czarist *regimé* is but another step towards reviving the controversy over the Liaotung lease and Japan's rights in the South Manchuria Railway zone.

Japan is apprehensive that another move is being contemplated to challenge her position in Manchuria; that China will now claim that the lease and concessions inherited from Russia are void and jointly with Russia will insist that the 1915 Manchuria Treaty extending these rights to 99 years, be cancelled. China has already proclaimed this treaty null and void, and called upon Japan to evacuate the Liaotung peninsula. The recovery of the Chinese Eastern Railway as provided for in the recent Sino-Russian understanding will have far-reaching effects if any attempt is now made to coerce Japan into surrendering her rights in Manchuria. A re-opening of these issues based on the illegality of the treaties arising out of the twenty-one demands and Russia's repudiation of old treaties concerning China, must of a necessity carry them back to Portsmouth and a reconsideration of peace terms in which Japan was swindled out of the fruits of victory by the profound secrecy maintained by Russia and China concerning the existence of their alliance.

The issue is bound to arise and when it does it will not be a matter for an international conference or the intervention of any third party. It is matter which exclusively concerns the two principals, Japan and China, one which Japan refuses to discuss with other powers. There is little doubt what the verdict of world opinion will be when the facts of how Japan was buncoed out of her just indemnity at Portsmouth are made public. It is only necessary to recall the wave of indignation which swept over the United States when the American people learned how their government had been maintained in ignorance of the inter-allied secret agreements concerning the disposition of Shantung and the South Sea islands until long after the opening of the peace conference in order to realize that world opinion will stand by Japan when it learns how history has been perverted and Japan robbed of her just rights by the operation of a more sinister type of secret diplomacy which converted Manchuria into the cockpit of the Far East. American opinion justly condemned such tactics and insisted upon a reversal of the Shantung decision and rejected the Versailles treaty itself largely because its government had been made the victim of secret diplomacy. Had the American nation been forced into a disastrous war and brought to the brink of bankruptcy through the operation of secret diplomacy there is no uncertainty as to what their subsequent action would be. Not until the score was evened up and the slate wiped clean would they have been willing to call the account closed.

The Japanese delegates to the Washington conference wisely refrained from commenting upon the text of the secret Sino-Russian treaty when it was read aloud by Secretary Hughes and hurriedly pigeon-holed. It went into the records and stands there as the trump card in Japan's hand ready for her to play at any time China or Russia or the two nations combined questions the legality of Japan's rights in Manchuria. The American government was given firmly to understand before the convocation of the Washington conference that Japan would not consent to any discussion of her acquired rights in Manchuria as part of the agenda and in answer to Dr. C. T. Wang's bill of grievances against the powers which included a plea for the cancellation of the 1915 treaties, Mr. Hanihara very clearly announced this determination on the part of his government and added that it was a question between China and Japan to be taken up at another time. He was very clear on this point. When, later on in the conference Dr. Koo filed the telegraphic summary of the Sino-Russian treaty of alliance and the president hurriedly buried it by immediately taking up another subject, he played into the hand of Japan by making impossible any further discussion of the Manchurian problem before an international conference.

* * *

The Status of the Chinese Eastern Railway

In view of the circumstances surrounding the convocation of the Washington conference and the general desire to befriend China, it is somewhat understandable why no American desired to stress the real status of a railway having its origin in a military alliance entered into to crush Japan. When it is recalled that the operation of the alliance which created the Chinese Eastern Railway and its branches was the compelling motive for the coming together of Great Britain and Japan in counter-alliance and that the Washington conference was convoked to effect amongst other things the termination of this alliance, it is also understandable why Mr. Hughes, after reading the telegraphic summary of the secret Sino-Russian pact of 1896 hurriedly shifted the subject by asking the delegates if any committee was ready to report. Secretary Hughes, as an expert authority on international law, undoubtedly grasped the full significance of China's official admission which firmly established as a historical fact what had hitherto been

revealed only in unofficial memoirs and newspaper articles and realized in a flash that any discussion of this important document would offset the arguments calculated to prove that the Anglo-Japanese alliance was the root cause of China's troubles and place the blame where it properly belonged. There was therefore every good reason for the chairman of the conference and his advisers to maintain a discreet silence. It was also natural that China's delegates should minimize its importance and divert attention from its bearing subsequent events.

This attitude is clearly shown in Dr. Koo's statement on the Chinese Eastern Railway made before the 6th plenary session of the conference on February 4 (two weeks after he filed the text of the secret agreement) in which he skilfully dodged the question by saying "I will not enter into the origin and the nature of the Railway Company." He could not honestly do this without citing the master-treaty. Further on in his statement Dr. Koo again diplomatically pointed out that the legal status of the railway was expressly defined in the agreements between China and Russia and between China and the Railway Company but avoided any reference to the date or character of the agreements between the two governments, as here again the only direct agreement between the governments of China and Russia concerning the construction of the railway was the secret treaty of alliance. The report of the sub-committee of technical advisers on the Chinese Eastern Railway submitted to the conference on January 23, declared that "the status of the railway is determined by the contract concluded in 1896 between China and the Russo-Chinese (Russo-Asiatic) Bank and the subsequent contracts concluded in 1898. As Dr. Koo did not file the telegraphic summary of the secret treaty until the following day (January 24) it is again clearly understandable why all official reports on the Chinese Eastern Railway submitted to the conference should be based on the assumption that its creation rested solely on the commercial convention, the only document permitted up to that date to appear in the public records. Attached to the above-mentioned report were certain observations and reservations made by Dr. Hawkling Yen, the Chinese representative on the sub-committee, in which he naively remarks that "the construction of this railway by the Russians was obviously for a strategic purpose" but carefully neglected to state the obvious nature of the strategic purpose as to do so would have brought his own country in as a full partner in the military enterprize.

It was true at the time the expert report on the Chinese Eastern Railway was drawn up that its status as far as the world was concerned was determined by the contract between China and the Russo-Chinese Bank but the minute Dr. Koo submitted to the conference the telegraphic summary of the secret alliance, the status of the railway was determined by this master-treaty signed four months prior to the commercial agreement. The character of the railway then changed from a purely commercial undertaking into a instrument of war and as such completely alters its status in international law. Although the master-treaty provides for the building of the railway for the express purpose of facilitating the access of the Russian land forces to the "menaced points" and to ensure their means of subsistance during hostilities, the commercial convention upon which its accepted status is based camaflouges its real purpose by stipulating in Article 8 that "*the company is responsible that the Russian troops and war materials despatched in transit over the line will be carried through directly from one Russian station to another without for any pretext stopping on the way longer than is strictly necessary.*" The commercial agreement designed to throw dust in the eyes of the world as to the real object of the railway was worded so as to create the impression that the transport of Russian troops was to be confined to their transit through Chinese territory from the Baikal to the Ussuri provinces of Russia and *vice-versâ* without stopping on the way, while the master-treaty clearly specifies that the transport of Russian troops to strategical points on the Korean border was the primary object of the enterprise.

In any further discussion over the status of this railway it would seem therefore that the claims of the powers other than China embraced in Resolution XIII of the Washington conference are secondary to the claims that may now be rightfully advanced by Japan to an equity in the property as legitimate spoils of war. Although because of the Portsmouth treaty this equity may not properly include the rights of Russia it can be made to cover those rights now claimed by China and ceded by her to Russia in the recent Koo-Karakhan convention. If China originally conceded the right to construct this railway and surrendered her administrative powers over the railway zone and at a later date leased a naval base and its contiguous territory to Russia all in conformity with the terms of an alliance aimed at Japan and by reason of the profound secrecy maintained concerning the existence of this document, escaped paying an indemnity for her participation in the war that ensued, and eleven years after the expiry of the alliance officially confesses her culpability, then it would seem that common justice requires that serious consideration be given to Japan's equity to a preferred position in the final disposition of the property.

The fact that the Manchuria question was not brought up at the Washington conference; that it was clearly left open as a matter which solely concerned China and Japan; that the conference neglected to discuss the bearing of the secret Sino-Russian treaty on the matters under consideration that would have clarified the situation, gives to Japan the unqualified right to protect her own vital interests when the time is opportune by entering into exclusive negotiations with China for a peaceful and permanent solution to the long-outstanding problems involved in her rights in that province inherited from Russia.

* * *

Justification of the 21 Demands

IF we seem to harp on a subject studiously ignored by other writers on Far Eastern affairs it is because we are convinced that no honorable or lasting solution is possible to these problems until the Sino-Russian secret treaty of alliance is accepted as the starting point of the negotiations. With an intimate knowledge of how events shaped themselves immediately after the signature of this treaty and how it provides the key to many otherwise inexplicable moves on the Far Eastern political chessboard which culminated in Japan's presentation of the twenty-one demands in 1915, we remain firm in our belief that only by China's recognition of her own faults accompanied by an honest desire to undo the damage occasioned by her secret diplomacy, can the world look forward to a prolonged era of peace and prosperity in Eastern Asia.

We do not censure Chinese statesmen or their many foreign advisers for putting the best foot forward and striving to conceal or minimize the far-reaching and grave consequences which followed the rash act of Li Hung-chang. We can appreciate how essential it is from the Chinese point of view to base their position in Manchuria on the railway convention and how vital to their interests it is to emphasize at every opportunity the injustice of the twenty-one demands. We can do this because it may be fairly said that nearly every argument denouncing these demands originated from the pen of the publisher of THE FAR EASTERN REVIEW who carried China's publicity campaign in America against the imposition of the demands in 1915. Much of the credit for enlisting the sympathy and support of the American people and their government in China's fight can be justly claimed by THE FAR EASTERN REVIEW. If at this late date we now hold other views it is because facts hidden from us at that time compel a radical and honest change of opinion.

We lay no claim to the title of Far Eastern expert but we may be pardoned for believing that no real expert in the ramifications of international policies in China as expressed through the intrigues of the various powers for railway concessions will dispute our right to speak with certain authority on these matters. The real story of China's troubles has never been told and we make bold to assert that it will never be chronicled by any of the many writers who for the past fifteen years have posed as authorities on Far Eastern affairs. There are just about six men alive to-day who could tell the inside story of the intrigues which split China into spheres of interest and nearly precipitated her partition. These men with one exception (I refer to Mr. J. O. P. Bland) have written no books. Their secrets are the secrets of their governments. Their memoirs will never be published.

These men knew there was a key to the Chinese puzzle and kept their own counsel. That key was not available for the ordinary writer until for the first time at the Paris peace conference the text of the secret Sino-Russian treaty of alliance was made public. Then, only three or four of the many Far Eastern experts gathered there recognized its real significance. Up to that time our own views inclined to the belief that the British railway program in

China followed a well defined policy of penetration that would ensure to Great Britain the lion's share of the spoils in the event of her collapse and partition. It was the Far Eastern expert of the British delegation who disabused our mind of this fallacy and gave us a diplomatic hint which led in a few days to the unearthing of the Li-Lobanoff secret treaty submitted to the conference by Sazanoff in support of certain Russian rights in Manchuria. The British expert is now the minister of his country to Peking and his concise and correct interpretation of Britain's motives in 1898 have since been publicly expounded by Mr. Balfour at the Washington conference. Great Britain was always on the defensive. The missing link was found and with this document it was an easy task to read aright the sequence of events which the world had accepted as a cold-blooded game of grab at the expense of China.

It was not difficult to follow step by step the unfolding of the stupendous drama which culminated in 1915 with Japan's demands upon China and to sense that under such severe provocation, Japan was justified in extracting such guarantees as would insure her security against any further menace through the violation of China's territories by foreign powers. This is too long a story to compress in a short magazine article of comment. If, however, we follow the tactics and reasoning of Mr. Thomas F. Millard, it can be demonstrated that Japan was either accurately informed, or at least should have been informed, of the existence and the terms of the secret Sino-Russian pact of 1896 when Minister Hioki unceremoniously handed the twenty-one demands to Yuan Shih-kai in January 1915. Certainly Japan had no knowledge of this document when she fought the war with Russia nor did she suspect its existence at any time during the progress of the Portsmouth peace negotiations. That she had grounds to believe that such an agreement was in force was furnished by the evidence of its practical operation. It is difficult to state with accuracy just when Japan became convinced of the existence of the treaty. It can be demonstrated that this truth was borne home to her diplomats when, after the expiration of the treaty, its full text was printed in the London *Daily Telegraph* as a contribution from Li Ching-mai (son of Li Hung-chang), Chinese minister at the Court of St. James at that time. Coming from such an authoritative source in an attempt to defend his father's memory against unjust attacks, the Japanese government was justified in accepting it as an official confession.

If, then, we assume that the Japanese government became aware in 1911 that it had been duped, betrayed into a war and brought to the verge of ruin and swindled out of just reparations through the operation of China's secret diplomacy and convinced as it was that Russia was preparing to resume the struggle, again utilizing the territory of China to launch her offensive, can Japan be justly censured for nursing a grievance until the opportune moment arrived to penalize China for her duplicity ? We do not advance this argument as the real justification for the presentation of the twenty-one demands—they rest on more solid grounds—but if the chief publicity expert to the Chinese government and leader of the anti-Japanese agitators is permitted to advance such a line of reasoning in support of his own pet theories, the rule must work both ways. If at any time prior to the outbreak of the European war, Japan learned of the exact nature of the secret Sino-Russian treaty of alliance, was she not amply justified in adopting any measures to make China suffer in part as she had suffered because of China's actions ? If a Millard argument is good for China, the same logic is good for Japan. If the American government, feeling that it was duped and unfairly dealt with during the war and at Paris by the operation of secret diplomacy which concealed the facts surrounding the inter-allied agreements regarding the disposition of Shantung and the South Sea islands belonging to Germany, and moved heaven and earth until its views finally prevailed at the Washington conference, is not Japan provided with a precedent for conducting an agitation and propaganda until the wrongs inflicted upon her by the operation of Sino-Russian secret diplomacy are righted ? If there is any honor left among the nations ; any sincere desire for a proper and lasting solution of Far Eastern problems, Japan must be accorded the justice now due to her.

* * *

The Bones Turn Blue

REVIVING issues which were ceremoniously interred at the Washington conference would seem like holding an inquest over a corpse to ascertain the cause of death. Well, that is not an unusual procedure. In China, they not only disinter the corpse but publicly cut the flesh from the bones, scrape and clean them and then boil them for hours. If the bones turn blue at the joints it is proof positive that the deceased came to an end by poison. The Chinese are very thorough in conducting their inquests. The time is close enough at hand to anticipate the inquest over the stinking mass that was hurriedly interred at Washington before the accused could be exonerated from the piled up charges of suborned witnesses. As far as China and America are concerned they seem determined to reject any evidence that might in any way mitigate their conception of the harshness of the twenty-one demands. The bones will have to be boiled.

The political wheel in its turning has once more brought to the top the man who as foreign minister in the Okuma cabinet was responsible for drawing up and enforcing these demands upon China. Viscount T. Kato is now the premier of Japan and there is every likelihood that during his tenure of office issues will arise involving a re-opening of the drama staged in Peking during the early months of 1915. From the Chinese and American viewpoint the sincerity of the Kato administration will depend largely upon his willingness to acknowledge that his former policies were wrong and to consent to negotiations looking towards the surrender of Japan's special rights in Manchuria—all that is left at this date of the twenty-one demands.

Events are rapidly forcing the issue. The recent Koo-Karakhan convention will embolden China to make further demands upon Japan based on the Soviet's repudiation of the old imperial treaties upon which Japan's position in Manchuria is legally based. In order, therefore, to preserve her vital interests in this territory Japan will be compelled to go behind the 21 demands, back to Portsmouth and still further into the past to find bed-rock and make her stand on the terms of the secret Sino-Russian alliance of 1896, the master-treaty which provides the key to modern Far Eastern history.

Then, and only then can a proper inquest be held and the story of China revealed to the world in its true aspect. With this document providing the key to what followed, Japan can piece together the events of the following years and fully vindicate herself before the world and demand proper reparations from China.

China's case rests squarely upon the single treaty resulting from the 21 demands. She does not go behind this document except in the case of the Chinese Eastern Railway whose status she asserts is determined by the railway convention of September 1896. The proof, however, is now officially recorded that the status of this railway convention is in turn determined by the master-treaty signed in May, 1896. Instead of an innocent commercial enterprise the railway stands clearly defined as an instrument of war fashioned secretly in order that China through Russia might be revenged upon Japan for her defeat in the war which terminated the year previous. The object of the railway was to crush Japan and bring her under the vassalage of Russia. Its cost of construction is offset many times over by the damages it occasioned to Japan in carrying out its specific purposes. In any court of justice Japan's claims to a large share in the control of the line must receive serious consideration.

With the evidence provided by the master-treaty and the still further proofs that can be submitted to prove its connection with the events which followed in rapid succession to undermine the sovereignty of China, the bottom is taken out of China's case against Japan in the 21 demands. The inquest will show that the bones have turned blue—that China was secretly administered poison and circumstantial evidence employed to fasten the crime upon Japan.

* * *

The Only Honorable Solution

THERE are many reasons involving the peace of the Far East and the interests of foreign commerce why these questions should be amicably settled as rapidly as possible in order that China and Japan can come together in some permanent understanding that will permit them to work out their destinies in harmonious co-operation. The American exclusion law closing the door to Japanese immigrants is the last act in a long-drawn-out

discriminatory program directed against all Asiatics. From the viewpoint of many Chinese there existed no good reason why the Japanese alone of all Asiatic peoples should be singled out for special treatment under our immigrations laws. It is probably a source of considerable satisfaction to this element to see Japan placed on the same basis of equality as other Asiatics but this feeling must in time give place to one that will throw them together for the preservation of their common civilization. The Chinese will remember when they have time to think about it that the act which excluded them from the United States was in violation of a treaty at a time when their weakness operated to make their protest a farce. They will be more likely to sympathize with Japan and look to her for support when the time arrives to press their joint claims to emigrate to lands now held as preserves of the white races.

For the present the main issue is that by excluding Japanese from the lands of the West they are turned back into Asia, and here, in order for her people to settle, own land, and live in peace with their neighbors, some special arrangement must be made with China. It is folly to believe that the Japanese will practice race suicide so the time will arrive when an outlet must be found for her mounting millions. The Japanese now realize that on their relations with China depends the economic life of their nation and the future of their progeny. In sheer self-defense Japan may decide that her only salvation lies in following the example of Russia, Germany and Austria and surrender her extra-territorial rights in exchange for privileges that will enable her children to own land and reside in the interior. If in pursuit of her own vital interests Japan should break away from the other powers whose doors are closed to her people and surrender her extra-territorial privileges in China, foreign domination and intervention in the affairs of this country will come to an abrupt end. It is true perhaps that the nationals of America, Britain and France could continue to conduct business under their present extra-territorial rights but the advantages enjoyed by their competitors would be so great as to ultimately drive them from the field.

Sooner or later extra-territoriality will be abolished in China. Once mistress in her own home and supported by Japan the influence hitherto enjoyed by foreign powers in this part of the world will disappear. This is probably one of the penalties the West must pay for its anti-Japanese agitations and Asiatic exclusion laws. Anything that throws China and Japan into a closer understanding and forces the latter to seriously ponder over the advantages to be gained by the surrender of extra-territorial rights, brings that much nearer the day when foreign influence in this country will become a thing of the past. China and Japan will come together despite the puny efforts of foreigners to keep them apart. American philanthrophy will not outweigh the natural attraction which draws two peoples of a common civilization into one unit for the preservation of their ideals and the right to exist in a world which is rapidly being divided into water-tight racial compartments.

China holds, as she believes, many grievances against Japan, all of which will disappear if approached in a sincere spirit to wipe out past differences in a new understanding. If Japan has erred, it can be proven that she labored under severe provocation and did what any other self-respecting nation would have done under similar circumstances. The fault can be laid to the door of China's own slipshod diplomacy and internal weakness. China may not need Japan's friendship at this time as much as Japan requires hers, but any fair inquest will disclose that China is deeply indebted to Japan for the damages inflicted upon her by the operation of the secret treaty with Russia. China will understand in time that the easiest and most honorable way to square the account is to frankly admit her mistakes and seek for some basis of an agreement that will close the doors to the past and open the way to a great and glorious future with the friendly support of Japan.

Japan is not in Manchuria of her own free will. China is solely responsible for Japan's presence in that province and owes her present sovereignty over the region to Japan's sacrifices. China must face the truth and gather the fruit of the seed she secretly planted in May 1896. On her frank admission of this mistake and a willingness to meet Japan in a new understanding based on the conditions of this historical document rests the only honorable solution to outstanding differences between the two nations.

Now It is the Cocopalm

For years the Chinese egg has been in bad odor on the Pacific coast although it arrives there in perfect condition so far as edibility and general excellence are concerned. The only trouble with it is that it is too cheap. Chinese chickens have acquired habits of frugality through the thousands of years since the first chicken laid the first egg or *vice versâ*, we are not concerned with the philosophical end of it, but it would appear that the Chinese fowl is a more efficient factory than the Pacific coast one and Petaluma rose in wrath, seeking to bar out the Chinese product. Bakers were compelled to put up signs saying that Chinese eggs were used in their products while their competitors were enabled to say "No Chinese eggs used here." And now a new "Yellow Peril" has arisen, we do not refer to the yolk of the egg—this time it is artificial butter that has to bear the brunt of Pacific coast inefficiency.

Once upon a time oleomargarine was fearfully and wonderfully made, a product that sometimes spread and at others simply curled its golden sheen around the butter knife much as axle-grease might do. In fact some declared that the only way they could tell whether it was margarine or axle grease was that the latter spread a little better. But the new coconut butters have changed all this and from the day in 1905, we believe, when Rocca, Tassy and de Roux churned up coconut oil and milk, sterilized it and made the first coconut substitute for butter, the margarine manufacturers have had not only to watch their step but take many steps for the proper preparation and purification of their product. Nowadays artificial butter is as pure and wholesome as that which comes from the cow via the churn. Purer perhaps, since no hand touches it from the time it enters the steam sterilizers until it emerges into the tins as a finished product. A firm in Oregon was the first to make a coconut oil butter and its use evidently is spreading to the detriment of the butter makers of the Pacific coast since they now have started a boycott against Philippine and other oriental vegetable oils, especially that of the coconut.

While they never will be able to stop the ingress of coconut oil into the United States, these poor benighted heathen of the Pacific coast (heathen being used in a strictly economic sense) have stirred up the Philippines government considerably and provoked the following five-headed *reclama* from the office of the governor general :—

1. Philippine oil that is exported is manufactured in modern mills that were put up only during the world war. These mills use up-to-date methods.

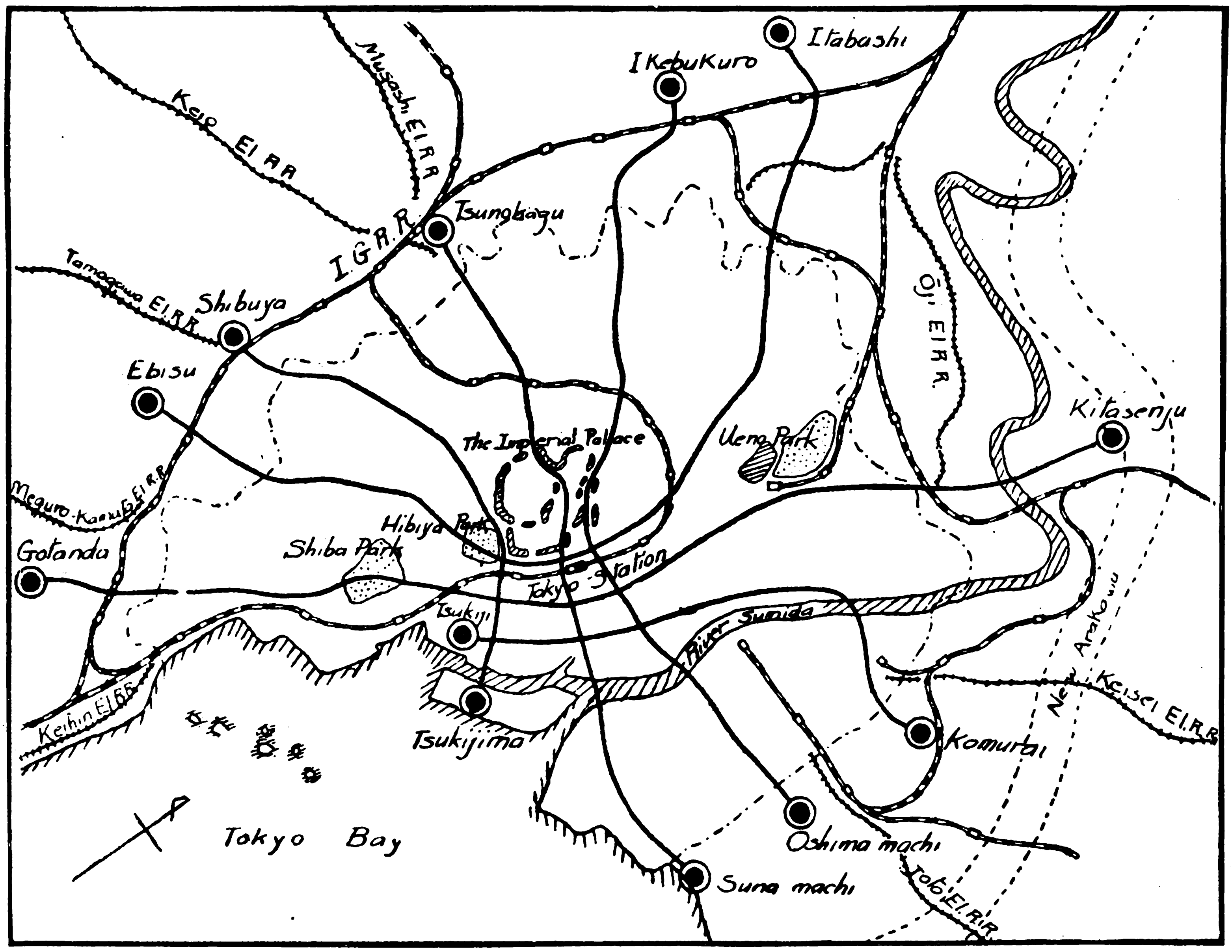
2. From the crushing of the copra to the loading of the finished oil into the trans-Pacific ships, no part of the product comes in contact with human hands.

3. In the process of manufacture the copra is subjected to germ-killing heat, from 212 to 240 degrees, Fahr. for, at least, 30 minutes, thus completely sterilizing the product.

4. For eatable purposes, or in the manufacture of margarines, coconut butter, lard substitutes, etc., in the United States, coconut oil has to be put through various refining processes. It is deoderized by forcing finely divided steam, through it, or by the use of hydrogen. Filtration through charcoal or Fuller's earth is resorted to, and in some cases a bleaching agent is also used. By means of these various processes, a white, bland, odorless and germless oil is produced, which is available for several uses of edible oil.

5. As for diseases in the Philippines, those that are contagious are adequately quarantined and the utmost possible protection is afforded the public against their spread. Through strict vigilance on the part of the government, the danger from infection from human sources in the Philippines has been reduced to minimum. In fact it cannot be any greater than it is in the United States.

As a matter of fact, the Philippine vegetable oil makers can defy the Pacific coast butter makers to produce a germless butter and can point with some satisfaction to the coconut butter substitute as being 100 per cent. pure and absolutely free from germs. But meanwhile the Chinese egg is having a rest and perhaps after a while, the butter makers' agitation also will die down and some other oriental product will have to bear the brunt of similar agitation on the part of those who, despite all tariffs and governmental protection, cannot stand the economic gaff.



The above drawing shows the six distinct subway lines (in solid black lines) that will form a network under the city. Notice that two of the lines go under the outer moats of the Imperial Palace. The round-the-city electric line is shown by black and white lines

Tokyo to Have Subways

FIRST formal steps have been taken to rebuild Tokyo along modern lines and the municipal council has approved the rough plans for 50 miles of subways for the city, according to the *Japan Advertiser*. The plans were presented by Mr. K. Nagao, chief of the electrical bureau of the council, at a meeting of the council in the Tokyo industrial club.

Engineers under the direction of Mr. Soyama have been working on the technical phases of the proposed subway system for two years, while the city has been contemplating such a system for an equal length of time. The rough draft presented and approved last night represents the results of these labors, which are now on the eve of fruition.

Wait Only for Contracts

The department of home affairs must accept the plans before actual work of construction begins. Contracts for financing and construction also will be formally signed at that time, probably with a foreign company which has long been on the field co-operating with and advising the city. The signing of contracts will be but a matter of form.

Plans of the electric bureau call for the construction of six distinct subway lines across the city, the 12 terminals being at or near the city limits. It is estimated that the subways, which will be double tracked, will cost Y.4,000,000 a mile, or a total expenditure of approximately Y.200,000,000. The six lines will be as follows:

Gotanda to Senju, 11.6 miles.
Ebisu to Itabashi, 11.2 miles.
Shibuya to Tsukijima, 5.5 miles.
Tsunohazu to Sunamachi, 7.6 miles.
Ikebukuro to Oshima, 8.3 miles.
Tsukiji to Komurai, 5.6 miles.

The double track system will be of the most modern type and will include first class equipment and rolling stock. An automatic signal and stopping system will allow the operation of high-speed trains at intervals as short as 45 seconds with perfect safety. The trains will be all-steel and the stations will be placed eight-tenths of a mile apart. Other details of the system will be worked out later when the plan as a whole receives the support of the Oovernment.

Ten Years for Building

It is contemplated to build the entire system during a 10-year period, and to begin work as soon as necessary steps have been taken. The city realizes that quick action is necessary, not only

in order to take care of the normal increase in traffic on the already overtaxed capacity of the surface lines, but also to absorb the increase in traffic that will result by the concentration of business into well defined central districts, where the new building regulations will require the construction of fireproof buildings too expensive for general use as combined residences and business quarters.

According to the electric bureau the loss incurred by the subway system during the first 10 years of operation will total approximately Y.15,000,000 or about Y.1,500,000 a year. This sum is counting the interest on loans and actual overhead expenses of operation. Beginning with the eleventh year the system is expected to start paying dividends. During the first 10 years the deficit will be made up from the receipts from the surface lines. Beginning with the eleventh year the subway will start paying back its debt to the surface lines, making its last payment on the 23rd year.

Engineering Not Difficult

The construction of a system of subways in Tokyo offers no new or unusual engineering problem, according to Mr. Soyama, and its cost, if built in connection with the other construction work necessary, will be comparatively small. Engineers, both Japanese and foreign, believe that a subway system is more practical and more safe than an elevated system. There is practically no danger from earthquakes as past experience indicates. Tunnels were injured by the earthquake last September only in such cases where the tunnelling was through a hillside, when the earth filled up the openings. In a subway there are no weak spots, the whole system being on one level below the surface.

The city officials realize that a subway system is absolutely necessary, not only as a phase of reconstruction, but also as a method of keeping pace with the changing form of Tokyo. The nation's capital is slowly developing from a conglomerate mass of little villages into a well organ'zed city with a centralized business section. This movement will be hastened when the city announces its building laws and restrictions, which will demand the erection of fireproof business edifices. In this manner the old type of half residence, half business house will disappear in favor of modern buildings for business only. Not many years hence people will "come to town" to work, and "go out home" after the day's work is done instead of merely climbing the stairs from store room to living quarters.

Will Relieve Tram Lines

The present tramway system has reached its limit of capacity and the mere addition of more cars actually decreases this capacity by slowing down the speed of each car. The rush hour jam at main intersections in Tokyo now is much worse than in any other city in the world, according to the electric bureau experts.

The surface tramways have grown from a total track mileage of 123 miles in 1911 to 184 miles in 1924, while the number of passengers has increased from approximately 140,000,000 in 1911 to about 500,000,000 in 1923, an increase of approximately 250 per cent. During this period the yearly income from fares per capita inhabitant of Tokyo has grown from Y.3.49 to Y.6.62, or nearly 100 per cent.

The proposed system must not be confused with another system which has been under contemplation by a private company for several months. Though this company is still in existence the earthquake last September discouraged the organization and nothing definite has been done recently.

Millions for Advertising Teas

Notes on the Tea Industry of Asia

PROHIBITION in America has created a thirst for tea. In the last few years the annual consumption has increased about 18 per cent. and it is now a little under a pound per capita. The annual consumption in England is seven pounds, in Russia two and a half pounds, in Canada five pounds and in Australia about nine pounds. During the fiscal year 1923, roughly 955,000,000 pounds of tea were imported into the United States and if this was doubled or brought up to the consumption in Canada or Australia, the tea industry of Asia would face a long period of prosperity. Tea growers are awake to the possibilities and are going after that prospective American business in the only way to succeed.

Foremost in this movement is the Indian tea growers' association which has voluntarily assessed its members $200,000 a year to carry on a five-year advertising campaign in the United States. The Indian government, it is claimed, is also aiding its tea interests. This great campaign for India tea is being conducted along systematic lines by Sir Charles F. Higham. No efforts will be spared to teach the public the advantages of drinking India tea and its superiority over all other kinds of drinks. The campaign is to be an open, direct effort to induce the American people to drink India tea without disparagement of coffee, cocoa or other beverages.

Following the lead of their Indian competitors the Japan tea manufacturers' association has also voted a small appropriation of Y.$10,000 gold for American advertising and has asked the government for an advertising subsidy of Y.500,000. This seems a ridiculously small amount in comparison with the fund raised by the India growers, yet it is doubtful whether or not the Japanese government at this juncture will be able to assist its tea industry to this extent.

The China Tea Situation

Tea merchants in China are also trying to develop the American market and the question of standardizing tea products, the elimination of milddle men and advisability of launching an advertising campaign are receiving attention. It is hardly to be expected, however, that the conservatism of the Chinese tea guilds will rise to the height of appropriating any large sum for foreign advertising and it is equally out of the question at this time for them to expect any financial assistance from their government, aside from the present exemption of China tea from the usual export duty for a period which was recently extended until the end of 1925. The future of the China tea trade faced as it is with the strenuous competition of India, Japan and Java, all willing to spend large sums for extending the use of their particular brands of teas, is not particularly encouraging. China was once the world's principal source for tea, but in recent years has been steadily losing ground as an exporter.

Before the war China exported 190,000,000 pounds of tea to Russia, but last year, only 61,000,000 pounds. From first position, China has sunk to fourth in the international market as a tea producer. Prior to 1914 Russia took about two-thirds of China's exports of tea, and this consumption was maintained until 1918. In the following year Russia drew upon China only to the extent of a fifth of her pre-war average. The decline then set in rapidly, the figures each year showing a steady drop. Although the loss of Russian trade was compensated to a small extent by the American market, still the situation is far from satisfactory. The tea guilds have obtained the support of the central government and secured concessions in interior taxation and also exemption from export duty. The Chinese government sent a tea commission to India and Ceylon and as a result a tea industrial training school has been established at Nanking, where the sons of planters from all the provinces of China are sent to learn up-to-date methods of cultivation. In 1915 tea experimental stations were established and arrangements made for granting subsidies to deserving tea planters. The first experiment station was established in the heart of the tea-producing district of Keemun, in Anhwei province.

Unfortunately, owing to constant internal disorder, the central government has not been able to continue the good work and pending the establishment of a government that will encourage the development of China's resources there is little hope that China tea

will regain its once proud position in international trade. In spite, however, of these many handicaps, the tea trade during 1923 showed large increases in exports, almost every market taking larger quantities as compared with the preceding year, the only exception being the United States which imported 17 per cent. less for 1922-23 than during the previous year. The trade at Foochow increased over a hundred per cent. in spite of the disturbed conditions that existed in that district during the season. The total exports were 6,874,432 pounds in 1922-23, compared with 3,231,735 pounds in 1921-22 and 2,221,738 pounds in 1920-21. The following table shows the destination of exports from Foochow for 1922-23 as compared with 1921-22:—

Destination	1921-22 Pounds	1922-23 Pounds
Europe	2,417,789	5,171,725
South America	82,375	52,181
Australia and New Zealand	218,752	687,797
United States and Philippines	230,204	447,379
South Africa	12,995	16,960
Coast southward	20,051	33,480
Coast northward	50,430	46,860
Other countries	199,139	418,030
Total	3,231,735	6,874,432

The 1923-24 season, which began June 1, 1923, has been the best since pre-war times.

The new campaign on the part of the India and Japan tea growers to increase the demand for their teas in the United States must have a still further depressing effect on the China industry and only by bettering methods of growing and manufacture and employing the same advertising tactics can China hope to regain even a part of her lost position.

Government Aid in Formosa

In Formosa, the Japanese government is applying to the tea industry a reorganization along modern lines of standardization and inspection. It is recognized that the tea industry of Formosa is far behind compared with such tea-producing countries as India, Ceylon and Java, where tea is produced under the " Estate system."

The tea-producing system in Formosa is very complicated, and as there are too many middlemen between producers and exporters the cost of tea is doubled or trebled by the time it reaches exporters, and quality degenerates through dishonest practices on the part of middlemen, resulting in unsuccessful competition and decline of reputation in foreign markets.

The Formosan government general has appropriated a subsidy for the improvements in production. The growers have been persuaded to organize, machinery, and other necessary equipment have been loaned, seedlings given gratis and a subsidy granted for purchase of fertilizer.

The Formosan government general has also planned improvements in marketing methods, and assisted in bringing the producers into direct touch with the exporters and packers in order to do away with middlemen.

In conformity with the official plan the plantation owners have combined in establishing a joint sales market in Taihoku, where all their output is sold hoping to realize the desired improvements in marketing methods. The rules of the joint sales market are as follows:

Art. 1.—The Joint Sales Market shall have a legal status of Kumiai (association of Guild), and shall engage in consignment sales and refining of tea produced by its members.

Consignment from persons other than its members may also be accepted according to circumstances.

Art. 2.—Those who are eligible to the membership of the market shall be corporations, guilds or partnerships established under the encouragement plan of the Government General.

Art. 3.—The title shall be " Taiwan Cha Kyodo Hambaisho " (Formosan Tea Joint Sales Market).

Art. 4.—The market shall be located in the city of Taihoku, and branch offices may be established according to local needs.

The Formosan Tea Inspection Regulations have been enacted by Government General Order No. 50, dated June 3, 1923. The tea under this regulation includes Oolong tea and Pouchong tea manufactured in Formosa. Tea traders under this regulation include persons engaging, for profit, in the manufacture, sale or purchase or exportation of tea to Japan or foreign counties.

With the adoption of this law as a basis for regulating sales and guaranteeing quality through government inspection further steps have been taken to save Japan's tea market from the competition of the better organized India industry. The Japan Tea Manufacturers Association as pointed out, has drafted a program to be put into effect with all possible speed, which includes an intensive propaganda campaign in America in favor of green tea. The Japanese tea growers believe that the Indian government is behind the huge advertising campaign in America and contend they cannot compete with this formidable competition without substantial financial aid from their own government and have asked for Yen 500,000, or one quarter the amount appropriated by the India tea interests. The Japanese association has also decided to appoint a new commission to study how to maintain or extend the overseas market for their products. The new commission is composed of 15 representative manufacturers and is headed by the president of the association. Three on the commission are authorized to supervise the advertisement and propaganda campaigns overseas.

The association will also maintain the reputation of Japan tea abroad by preventing the exportation of inferior tea and introducing innovations in the method of manufacture. Seven representative manufacturers are to form a commission for the conduct of the work.

* * *

Tea Cultivation

All tea comes from the same kind of plant, the name varying according to the country in which it is produced. Fundamentally it is the same everywhere, showing only such differences as are traceable to the climate, the soil and the method of manufacture.

The tea producing countries of the world to-day are India, Ceylon, China, Japan, Formosa and Java, Sumatra is now beginning to yield some tea, but the quantities are negligible as yet.

Tea that is fermented is known as " black ; " unfermented tea is commonly called " green." There are also varying grades of fermentation. Ceylon, India and Java, for example, produce very largely fermented or black tea ; Japan produces only unfermented tea : China, both black and green, and Formosa, semi-fermented tea.

In the case of fermented teas, the natural sap is permitted to remain in the leaf for a certain length of time after it is picked. The leaves are prepared on withering trays for this purpose. This moisture is of such a nature that it works a chemical change in the leaf until the organic nature of the leaf is actually changed into an entirely new substance.

Just Like Hops

It is exactly the same thing which takes place in the handling of hops for the manufacture of beer. You will easily realize from this that the same tea plant can produce either fermented or unfermented tea, otherwise known as black and green tea—the difference being in the method of handling the leaf.

In making unfermented or green tea, the leaf is carried at once from the tea field to a room where heat can be applied to it (which is done in very simple fashion by the farmers of Japan, China and Formosa) ; the pores of the leaf are closed by the heat, this prevents the tea from fermenting and holds the elements produced by the soil. In comparison with wines, the green teas may be said to correspond to the dry champagnes, and Rhine wines, while the black teas remind us of the Burgundies and clarets, being of a thicker consistency.

In making fermented or black tea (which comes largely from Ceylon, India and Java), the leaf is permitted to ferment and after this process has been continued for a given period of time, the leaf is then fired so as to hold it in that state or condition—the fermentation being stopped by the firing.

Also Semi-fermented

In Formosa and the Fukien province of China, where Foochow teas are produced, the leaf is semi-fermented, that is, the process of exposure to the air before firing is not carried as far as in the case of fully fermented or black tea.

The methods that have been described of curing tea produce in the infusion, different ingredients and in the liquor, different colors. The consuming trade sometimes think they are getting very thin tea when they purchase the unfermented or green sorts, whereas

in reality they are getting a different combination of ingredients. A cup of tea drawn from the fermented or black leaf would lead the average consumer to think that the infusion was much stronger than that from the unfermented or green leaf, while in fact the thin looking cup of tea may have in it elements that are more powerful than those in the darker looking cup of tea.

Tea Thrives in Mountains

The places which produce the finest tea are always found among the grandest mountains. The tea plant loves the well drained side of a hill stream.

Tea requires a good, sound soil, a light loam, well mixed with sand and overlooking a winding mountain, vegetable matter, moderately moist, and yet not stagnant or sour. Tea fields are very much the same the world over, except that the spots producing the finest varieties, like the spots growing the finest wine grapes are extremely limited.

In China, Japan and Formosa, the culvation of tea cannot be carried on to such a state of perfection as in Ceylon and India, partly because the soil is not as rich, and partly because the farming is in a cruder state in the first mentioned countries.

In the case of the tea fields of Ceylon there is a tremendous acreage, almost all of the land being available for cultivation. The handling of the estates is in the hands of intelligent agriculturists who have in their employ, chemists who are continually analyzing the soil and bringing the productive qualities of the land to the highest point. The estates of Ceylon and India, the home of orange pekoe tea, are managed by Englishmen, who naturally can bring to bear the most scientific methods—methods practically unknown in other countries. It may be said for Japan, however, that they have established a scientific shcool for the handling of the tea plant, and that they are studying to improve the industry.

Climate is Important Too

Climatic conditions enter very largely into the quality of tea produced in a year's time. In Japan and China the amount of moisture in the atmosphere is negligible, except in the very rainy seasons when they have a large precipitation. In the Island of Formosa there is more moisture, but they also have a climatic condition which produces cold weather so that the vegetations dies. Orange pekoe tea, grown in India, is produced under favorable conditions, because there is moisture in the atmosphere that helps dampen the ground continually and keeps the plants growing, so that many more pickings are possible in India during the season than are possible in Formosa. The seasons in China and Japan are the shortest of any. In the case of Ceylon and Java, however, there is continual precipitation. If it is not in the form of rain, it is produced by the heavy dews, so that vegetation is continually growing and teas can be plucked the year around. A field of Ceylon, India orange pekoe tea is a far more valuable piece of property than a similar one in any other country because the picking proceeds throughout the year.

Gathering and Curing Leaf

Harvesting the leaf is practically the same in all countries. The firing process, also, in its essentials, is practically the same, as it simply means the application of a certain degree of heat to the leaf. The receptacle in which the tea is handled may be a simple wicker basket, with a platform separating it from the charcoal fire made underneath it, or it may be the pans of Japan, or the biggest machinery used in the orange pekoe fields of Ceylon, India.

Separation of Tea

The next process after the withering and firing of the leaf is the separation into grades, such as come to market. This is done either by hand, or by machinery as in Ceylon, India, where a superior grade of tea, orange pekoe, is grown. China has some crude hand machinery which is used in eliminating dust and stalks from the teas, but in the case of Japan, the sifting and separating of tea is one of the most extensive of all methods, for the leaves here are separated into ten or twelve different kinds, from which the various grades are made up. One sieve eliminates dust, siftings and stems and the nibs of the leaf. By sifting, the leaves are divided into coarse, fine and medium. Then the leaves are taken and divided into various degrees of coarseness or fineness, and after the entire batch is sifted out, certain sizes of the leaf are put back together to form the grades that are offered on the market.

The packing of teas, whether into small packages or into regular chests, is really the same the world over. There are facilities in all the different countries for packing teas, under private brands, in almost any size and quantity.

* * *

Honorable Tea ("O Cha")

Japanese Methods

Japanese tea is classified according to quality into three grades : (1) Hikicha, or powdered tea, which is the highest quality and is used only on ceremonial occasions. (2) Gyokuro and Sencha, which are both called green tea by exporters ; Gyokuro is of better quality than Sencha, the latter being drunk by the bulk of the people. (3) Bancha, which is the lowest quality and consists of old leaves mixed with withered stalks and chopped twigs. The green teas—Gyokuro and Sencha—for export purposes are generally divided into six kinds : (1) Pan fired tea ; (2) basket fired tea ; (3) nibs ; (4) fannings ; (5) dust siftings ; and (6) brick. The first three sorts are the best and derive their names from the method of firing used, the last three kinds being the poorest qualities.

Tea is grown in all parts of Japan with the exception of Hokkaido. According to the latest figures of the department of agriculture, the total area of the tea plantations is 50,000 *cho, i.e.*, 122,500 acres (1 *cho*—2.45 acres), and the annual production amounts roughly to 83,000,000-lb. The number of manufacturers exceeds one million, so it is obvious that tea growing in Japan is still a househlold industry.

The Japanese tea grower prefers to plant his bushes on the lower slopes of hills, although, providing the drainage is satisfactory, successful plantations can be laid out on the level plains. The bushes are usually allowed to reach a height of about 3-ft., but in the famous Uji garden they are frequently 6-ft. high. A peculiarity of the Uji district is the cultivation of tea plants under artificial shade, provided by straw mats, which tends to produce a better quality leaf of a darker green colour. The leaf from these shrubs, sheltered in this way from the sun, is highly esteemed by the Japanese and grown exclusively for their consumption. There are as a rule four crops in the year, the first crop, which is usually picked in the latter part of April, producing about 50 per cent. of the annual yield. The picking of the second crop begins about 40 days after the first, and contributes 30 per cent. of the total. The remaining 20 per cent. is obtained from the third and fourth crops, the leaves of which are of inferior quality. Throughout the country tea-picking is carried out by women, practically without exception.

The Japanese believe that it is impossible to produce the correct delicate aroma by mechanical treatment of the leaves, and so in the production of the better class of green teas no machinery is used, the whole process being carried out by the old-fashioned hand method. In the case of exported tea, however, machinery has taken the place of hand labour, or machinery and hand labour are employed in combination.

Preparing the Leaves

The preparation of the leaves begins as quickly as possible after picking, and in the case of green tea, which forms the bulk of the Japanese tea crop, the first process is steaming. The leaves are steamed for a few moments only, so that they retain their green colour and acquire the peculiar aroma at the same time. The steamed leaves are then dried and poured into firing trays lined with paper, where they are turned over repeatedly by the workmen. As the firing progresses, the fresh green colour of the leaves gradually changes to an olive brown, and the fragrant odour of the tea becomes perceptible. The mass gradually shrinks in size as the moisture evaporates, and when finally pronounced to be dry it is seen that each leaf is separately twisted and rolled. The whole operation of firing lasts about three hours, but where machinery is employed the same process can be completed within 1½ hours.

Japanese tea was not introduced into foreign countries until 1868, in which year some 13,000,000-lb. were exported to the United Kingdom and the United States. Since then, the export trade of Japanese tea to the United States has greatly increased, and the leaf holds a very strong position there. Owing to the overwhelming competition of the Indian product, the green tea made little impression in the United Kingdom, and has found no favour there. Japan now exports yearly 44,500,000-lb. of tea, 85 per cent. of which

consists of the pan-fired and basket-fired varieties. The largest customer is, as already mentioned, the United States, China and Canada ranking next.

Besides green tea, Japan produces Oolong tea, which is exclusively produced in Taiwan. The area of this island's tea plantations is stated to reach 38,000 *cho* (93,100 acres), the average yield being 30,000,000-lb. Two-thirds of the whole crop is absorbed by the United States. A small quantity is also exported to Europe, where it is used as blending tea. Home consumption is very small, as the majority of the Japanese people are accustomed to drinking green tea without sugar or milk, and Oolong tea cannot be drunk neat.

The High-Pressure Steam Convention of the Institute of German Engineers

Held in Berlin, January 18 and 19

MANY branches of the technical industries are highly interested in the question of raising the working pressure of steam boiler plants in order to save fuel. A clear proof of this is the number of persons present at the opening of this meeting, at 3 o'clock on the afternoon of January 18, in the Beethoven Hall of the Philharmonic Society of Berlin. Approximately 2,000 engineers from all parts of Germany and from many foreign countries attended, many of whom had to stand in the crowded hall.

The president of the association of German engineers, Professor Dr. G. Klingenberg, opened the first day's meeting by a speech, in which he briefly reviewed the lectures which were to be held during the convention and would deal with the progress made in the matter under discussion. By utilizing the most recent improvements, we are in a position to raise the economy of steam plants practically to the same level as that of Diesel engines, and to reduce the coal consumption of power plants to about one-half of the present figures. These improvements are not restricted to steam technics, but also affect the technique of boiler furnaces. In steam plants it is essential not only to raise the working pressure, but also to improve the design of the st am turbines, to employ intermediate superheating, to preheat the feed water with steam tapped from the turbine, in order to create conditions which will render it possible economically to utilize such high-pressure steam.

The technique of furnaces has made an important stride forward in this direction by using pulverized coal with these furnaces inferior direction by using pulverized coal. With these furnaces inferior fuel can be burned as economically as best quality coal, a problem of paramount importance under present conditions. Another item of interest for power stations is that the pulverized coal furnaces avoid all fuel losses when shutting down and restarting the boilers.

Director Dr. Münzinger of Berlin then discussed the technical and economical principles of the production and utilization of high-pressure steam. His lecture chiefly analysed the question as to under what conditions savings can be made in the total running expenses of a works by increasing the steam pressure, bearing in mind the reduced coal consumption on the one hand, and the increased expenses for erection and depreciation of a new equipment on the other hand, questions of vital importance to every owner of a power plant. The result of his investigations proves that between 15 and 100 atmospheres (213 and 1,420-lbs. per sq. in.) pressure this question must be treated to meet the individual requirements of the power station.

For a station, the steam of which is exclusively used to produce power, the economically most favorable result, *i.e.*, 3 to 7 per cent., is obtained when the pressure is raised to approximately 35 to 50 atmospheres (500 to 710-lbs. per sq. in.). Beyond this pressure, the costs of the boiler drums exceed the possible saving. The lecturer, threefore, advocates boiler designs whose water and steam chambers aer limited as far as is compatible with reliability and the production of dry steam. If, on the other hand, a power plant supplies large quantities of steam against high back pressure for manufacturing purposes, as is the case for instance in the chemical industry, a saving of 10 to 20 per cent. on the running expenses can be made, even when the boiler pressure has been increased to 100 atmospheres (1,420-lbs. per sq. in.)

This shows that high-pressure service will for the time being be most advantageously applied to combined heating and power plants operating with back pressure; however, also in pure power stations a saving of approximately 25 per cent. of the thermal value of the fuel consumed can be made with a slight increase of the pressure, if intermediate superheating and gradual preheating of the feed water by means of steam tapped from the turbine is adopted. It is most probable that the power plants of the future will be designed along these lines, though steam accumulators in the low-pressure circuit, coal dust furnaces and air preheaters may be added.

The next lectures given by Professor Dr. Goerens of Essen and Director Loch of Düsseldorf dealt with the question of materials and the manufacture of steam boilers for high pressures. Dr. Goerens chiefly pointed out the advantages accruing from the employment of nickel-steel, the greater mechanical strength of this material permitting the boiler drums to be made of thinner plates, which are more easily machined. Besides this, the nickel steels with 3 and 5 per cent. of nickel, are preferable to the mild steel prescribed by the laws, because when the boiler is subjected to higher temperatures, they do not show such a reduction of the mechanical strength or such increased brittleness as mild steel does. This enhances the safety of the boilers. Dr. Goerens recommends making high-pressure boiler drums of one single forged or rolled piece, which can be subjected to the necessary hydraulic tests, to ascertain if it has the requisite mechanical strength before delivery.

Mr. Loch illustrated his lecture with lantern slides showing the audience the complete manufacturing process of a modern boiler works. He also demonstrated how deterioration or damage of the materials is nowadays avoided by controlling the temperature when heating the plates, and the pressures when riveting the boilers. Two films, giving views of the boiler works of Borsig and Dürr, followed the lecture.

Second Day's Meeting

The second day's meeting was likewise opened by a short speech of the president. He suggested that the burden of work, which was about to devolve on the engineers and works before practically realizing high-pressure service, might be rendered more tolerable if the high-pressure steam convention would accept a pressure of 35 atmospheres (500-lbs. per sq. in). as a temporary limit, and, accordingly, would establish certain standard boiler sizes. Further details could then be discussed in the boiler committee, which has for some time past been appointed by the association of German engineers.

Dr. M. Guilleaume of Merseburg reported very interesting and important experience gained in steam boiler plants, based on tests made by the association of large boiler owners, founded in 1920, to promote the safety of large boiler plants. These tests prove that utmost care must be exercised when testing the boiler plates, so that the designer may be convinced that the plates in their entirety possess all the qualities which were ascertained during the tests, and, furthermore, that the machining of the plates until they are assembled in the finished boiler, especially too high a riveting pressure, can very materially affect the properties of the plates and render them unreliable. The observations made with special measuring devices of novel design to ascertain the alterations of shape to which the finished boiler is subjected owing to fluctuations of the temperature and pressure are of great value.

These alterations can never be entirely avoided in actual service owing to the fluctuations of the load, therefore it is essential to design the boilers so that they have sufficient elasticity and that no undue stresses arise in any part of the boilers. On the other hand one should also strive to eliminate such influences by keeping the load on the boilers and feed water supply as constant as possible. Very valuable observations have also been made concerning the circulation of the water in boilers. The results of these observations are of special interest now that it is contemplated to run boilers at very much higher pressures than were usual up to the present.

The last speaker, Professor Dr. E. Josse of Charlottenburg, lectured on the properties and utilization of high-pressure and super-pressure steam. He told his audience that when the working pressure is raised from 20 to 100 atmospheres (284 to 1,420-lbs. sq. in.), the most recent data concerning the properties of steam proved that theoretically the useful work available in 1 kilo (2.2-lbs.) of steam could be increased by 15 to 83 per cent. according to the back pressure obtaining. However, if this is to be applied to a steam engine or steam turbine, two points must be observed: First, that high-pressure steam becomes saturated much more quickly when

expanding, because, for reasons of safety, superheating may not be increased beyond a certain maximum temperature; Second, the work to be produced by the steam in the high-pressure zone will be the greater, the higher the initial pressure is taken. The first point makes it compulsory to dry the steam repeatedly during the different stages of expansion up to back pressure, as otherwise the water contained in the steam would reduce the thermo-dynamical efficiency.

The second point is of special importance for steam turbines, the present design of which, contrary to that of reciprocating engines, is not suited to economically utilize the steam in the high-pressure zone. As a matter of fact, recent high-pressure steam technics have been the incentive to develop special types of turbines which economically utilize high-pressure steam and are the first practical results of modern high-pressure practice. A number of works are already busy building such turbines, and the very extensive tests made with a high-pressure turbine designed by the Erste Brünner Maschinenfabriks-Aktiengesellschaft, showed up an efficiency of over 80 per cent, a figure, which up till now, and been deemed impossible for steam turbines.

The lectures were followed by a debate, lasting several hours. Space does not permit giving a detailed account of the interesting topics which were discussed during the debate. To carry them, a special number, entitled "High-Pressure Steam," containing the lectures, the debate and several other articles dealing with the same subject, will shortly be published by the association of German engineers.

The convention has undoubtedly been a great success, and it is, therefore, not astonishing to hear that several members have called for a second debate on this very interesting and instructive topic. The closing words of the president, with which he asked the audience to honor the undaunted inventor Wilhelm Schmidt, the pioneer in the field of high-pressure steam, in whose spirit the meeting has been convened, wre hailed with hearty cheers.

Railway Development in Indo-China*

ALTHOUGH the French occupation goes back but a few decades and in spite of the fact that the first few years were troubled with various outbreaks of insubordination, railways have been established and have been in operation for some time now. A program of economic development of the peninsula by means of railroads has been prepared and is now being carried out so that the railways actually built should not be considered by themselves but as part of a whole.

The few original private companies have been bought up by the government so that, as in most neighboring countries, the railways are government property and under its direct administration. A few words regarding the carrying out of this program to its conclusion are not without interest. As regards the money required this is generally set aside in each year's budget for the work to be done during the year. Loans are sometimes resorted to in cases, for instance, when it is required to accelerate the building of any given line and so far these have been quite successful. Prospecting new routes is carried out by special commissions appointed for the work or by the public department. The track making, rail laying and the building of stations, depôts, etc., is entrusted to local contractors under government supervision. The supply of steel sleepers, steel bridges, locomotives and rolling stock is obtained by tender from any recognized engineering firms. Naturally enough French tenders have been getting all the orders but there is no reason why foreign firms should not tender also when any of the above-mentioned material is required. As a matter of fact it is understood that there are actually Japanese-built locomotives in use which were bought some years ago and it is evident that a country fairly close at hand like Japan with good shipping facilities can supply with a very low cost for freight.

To give an idea of the work still to be accomplished it is interesting to note that the present program of lines totals some 4,600 kilometres and that of this distance but one-half is in operation, including the line to Yunnanfu, so that there is still plenty to do. The lines in existence in Tonkin and in Cochin-China have not yet been linked together so that at present, for administrative purpose' they are divided into the North Indo-China and South Indo-China railways.

The continuation of the work required by the program of railway development calls for feats of a very high technical level, as the geography of the country will show. Around Hanoi and Saigon are huge river deltas of soft alluvial plain requiring tremendous bridges with caissons sunk 30 or 40 metres deep to span the waterways. Along the sea border on the east the coast is continually cut by gaps and openings of various sizes through which rapid streams make their way to the ocean or in which are large low-lying expanses given over to salt making. Inland lies the fertile valley of the Mekong river with its tremendous volume of water flowing more or less parallel with the coast and between these two is the Annamitic range of mountains with an average height of 1,000 metres. As it will be understood from the above description railroad making is not simple work and takes time. As a corollory it will be seen that much money still has to be spent but it will be well spent and in years to come will repay an hundredfold.

When the railway system of French Indo-China is completed it will form a whole with various political, strategical and economic consequences. Roughly speaking, this system will contain six distinct lines with different objects in view. Taking the sea-lines from the north and working southwards they will be as follows: First the line from Hanoi to Yunnanfu the capital of the Chinese province of Yunnan. This line was built years ago (after the Russians had built the Manchuria railways and when each foreign nation was obtaining concessions in China for building railways), with the idea of draining the produce of Yunnan to a French port and increasing its wealth, and this was well accomplished if one considers the growth of Haiphong which is the port for Hanoi. If we remember right, it was intended to continue this railway to Szechuan province, perhaps the richest in China, but evidently some obstacles have arisen in the way of its carrying out. This line is 860 kilometres long, is a marvel of engineering achievement and is paying its way.

After this line is the local Tonkin railway about 17 kilometres in all radiating round Hanoi and towards the points on the Chinese frontier. This district is densely populated and the traffic quite intense. As a result the parts of this railway already in operation are bringing in good returns.

Connecting Hanoi to Saigon is the Trans-Indo-China railway not yet completed. It is 2,100 kilometres long of which three sections are already built; these are Hanoi-Vinh, Don-gha-Tourane and Nhatrang-Saigon totalling 1,200 kilometres. The first section is paying its way but the two others are showing a deficit yearly due to the scanty population of the districts connected, but it is expected that this state of affairs will cease as soon as the whole line is completed. This line is being pushed by the government as it also has a strategical importance.

A line being planned at right angles to the Trans-Indo-China railway is that between the east coast about Vinh to the Mekong river at Thakek, passing through Tanap. This line, 187 kilometres long, will be used as an outlet for the products of Laos province which is at present blocked in between the Mekong river and the Annamite Range and which has a tendency to look towards Siam for an outlet for its produce.

Another line is planned from Saigon to the Siamese frontier near Battambang, 645 kilometres in length, to connect up with the Siamese railway to Bangkok. When this line is completed and the Trans-Indo-China also, it will be possible to travel right through by rail from Penang to Hanoi and this will be a big step towards the making of a south Trans-Asiatic railway.

The last railroad down on the program is a local railway for Cochin-China connecting Saigon to the rich districts lying to the south-west now producing rice. This line is roughly 340 kilometres long of which 70 are already built from Saigon to Mytho. The traffic is mostly dependent on passengers but this portion of the line is quite prosperous. As already stated the completion of all these lines still requires time but there can be no doubt as to the ultimate prosperity to be derived for Indo-China from the development of its railway system.

* J. Ruet, in *L'Information del Extreme Orient.*

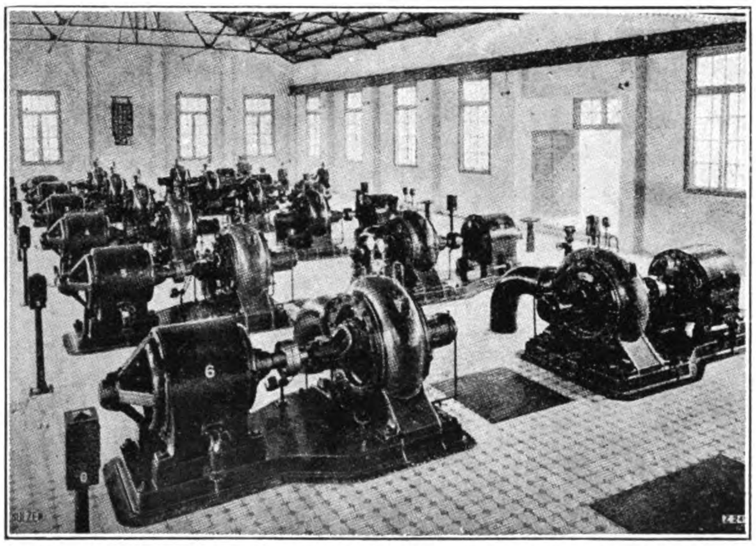
Osaka Waterworks

A Sulzer Installation in Japan

MANY towns and country districts in Japan possess waterworks equipped on modern lines, and one worthy of particular mention is the Kunishima Waterworks, of the municipality of Osaka. The original scheme was to provide pumping sets delivering 450—500 cub. ft. or 600—700 cub. ft. per min. against a manometric head of 200 ft., but after further consideration of all matters, it was finally decided to install sets delivering 600 cub. ft. per min. against a manometric head of 180-ft.

The following is an extract from the specification issued to the firms invited to tender for the work :—

" The pumping machines required are, in all, twelve in number, each machine consisting of a centrifugal pump direct coupled to a three-phase induction motor of high efficiency. Each pump should be capable of lifting filtered fresh water at a steady and continuous rate of at least 600 cubic ft. per min. against a total manometric head of 180-ft. The water level in the suction well is expected to fluctuate from 4-ft. to 14-ft. below the floor level. Every pump should be capable of sucking up water from the suction well, through the strainer, foot valve and suction piping, against any suction head within this range. If oil be used for lubrication of the stuffiing boxes or glands in the walls, or covers of the casing through which the shaft passes, some means should be provided for preventing it from entering the inside of the casing. The masses of the revolving parts should be perfectly balanced, so that there is no vibration or



Municipal pumping station, Osaka Waterworks (Japan). 12 Sulzer Centrifugal pumps delivering a total of 7,200 cubic feet per minute against a head of 180 feet.

noise when the pump is running at any speed attained. The casing should be so designed and made, that the inside is easily accessible and the impeller and guide ring can easily be taken out whenever required. Every part of the pump should be designed and made with such strength and stiffness, that the machine can run continuously with safety, even when the load is 20 per cent. more than the normal."

The particulars given in the specification called for 12 Sulzer pumps, each delivering 600 cub. ft. per min. against a manometric head of 180-ft. and running at 1,170 revs. per min. to correspond to the periodicity of the three-phase supply which is 60 cycles.

The interior of the completed pumping station is shown herewith. The pumps are of the single-stage high-lift centrifugal type with guide rings and constructed to a special design.

The twelve pumps were submitted to specified tests, in batches of four, these tests being carried out at Winterthur before despatch. The testing arrangements conformed to the usual practice as laid down and approved for official tests.

The manometric head was ascertained by actual measurement of the suction head from the water level in the suction well to the middle of the delivery pressure gauge, and by measuring the pressure head by means of a control pressure gauge. The quantity of water delivered was measured by a Venturi meter and the head adjusted by throttling for which purpose a gate valve was employed. The pumps were belt-driven by a 500-h.p. three-phase motor, the characteristic curve for which was obtained by a mechanical brake and electrical measurements. The power absorbed by the shafting and belting was ascertained by uncoupling each pump. Table I shows the test results of the first four pumps running at 1,170 revs. per min.

All four pumps easily attained the guaranteed efficiency of 80 per cent. and in some cases exceeded it by 1 or 2 per cent. The quantity of water delivered by the pumps and the heads against which they could work also proved to be somewhat greater than what had been anticipated from the calculations and tests made with pumps already built on similar lines.

The official trials at Osaka after the pumps were installed, were carried out under the supervision of professors of the Osaka technical college appointed at the request of the Municipality.

All twelve pumps were tested on site and the results of some of these tests are given in table 2. When these results are compared with those obtained at Winterthur, it will be seen that they confiım that the efficiency of the pumps exceeds 80 per cent. *En.*

TABLE 1.

	Guaranteed	Tests					
Delivery, cub. ft. p. min.	600	594	755	596	600	615	716
Suction Head, ft. mano		10.5	10.5	10.2	10.2	10.2	10.5
Delivery Head, ft. mano		186.3	170.8	186.0	189.3	196.8	177.8
Total Head, ft.	180	196.8	181.3	196.2	199.5	207.0	188.3
Revs. per min.	1,170	1,178	1,162	1,160	1,168	1,167	1,165
H.P. at motor shaft		289	339	289	299	304	339
H.P. lost in shafting and belting ...		16	16	16	16	16	16
H.P. absorbed by pump	260	273	323	273	283	288	323
Theoret. H.P. of pump in water raised		225	264	225	230	245	259.5
Efficiency of the pump per cent. ...	80	82.5	81.7	82.5	81.3	80.6	80.3

TABLE 2.

	Guaranteed	Test No. 1	2	3	4	5	6	7	8	9
Load, approx. ...		1/2	3/4	7/8	4/4	9/8	4/4	5/4	4/4	0
Delivery, cub. ft. per min. ...	600	240.4	465.9	532.1	610.3	681.3	613.7	769.1	612	0
Delivery Head, ft. mano		192	192	188.7	185.5	177.6	185	163	177.5	172.5
Suction Head, ft. mano		7.9	7.9	8.1	8.4	8.9	9.1	9.6	14.8	14.7
Total Head, ft. mano	180	199.9	199.9	196.8	193.9	186.5	194.1	172.6	192.3	187.2
Revs. per min. ...	1,170	1,200	1,185	1,180	1,175	1,170	1,175	1,175	1,180	1,190
Motor input in k.w.		128	186	202	222	241.2	224.8	262.4	223.2	90
Net power in k.w. ...		67.9	131.7	148	167.3	179.6	168.4	187.6	165.4	
Combined efficiency per cent. ...	74.5	53.04	70. 79	73.27	75.34	74.32	74.9	71.5	74.1	

American Gold Concession Ratified

The union council of people's commissaries has ratified a concession agreement with an American syndicate headed by Mr. Jameson Wint for the working of the gold bearing areas along the river Semirtak in the Amur district, according to a Rosta report from Moscow. This is similar to the Smith concession ratified last November for gold-production along the river Charga. The concessionaire undertakes to erect on the area assigned to him sufficient dredges to work steadily for a period of 20 years. The gold-bearing areas are to be properly equipped by him not later than by July 15, 1925. He undertakes to work at least 2,572,500 cubic feet per season. In addition to paying rent for the area assigned to him, the concessionaire will also pay a certain percentage of the gross output of gold. The government is to have the prior right of buying the whole of the gold output.

The hire of labor, and all matters relating thereto, are to be strictly in accordance with the established Soviet labor laws and regulations. They are to be governed by collective agreements between the concessionaire and the trade unions. As a guarantee of the proper execution of the agreement, the concessionaire deposits property to the value of 35,000 gold roubles. All conflicts between the parties are to be submitted to the law courts of the Soviet union. The concession is granted for 26 years.

Mongolia—A Sorry Picture

By Dr. Jacques K. Maguite

MONGOLIA is one of the most interesting countries on the whole globe. Seven centuries ago the heart of a gigantic empire throbbed there. There stood peaceful cities and there the fates of nations and kingdoms were decided. There those chains were made which held in bonds for two-and-a-half centuries Russia and part of Central China. The sad consequences of that bondage may be felt even now. Those wide plains were inhabited by droves of horses, while 10,000 tents were scattered about these steppes and on the slopes of the mountains. At night countless fires lighted the plains and around these the terrible warriors of the great Chingis Khan clustered. The creaking of wagons, the lowing of herds, the neighing of steeds and faint shouts of the people were the noise which filled the air. All there was full of life and movement, everything was boiling over with energy and impertinent bravery. But now ? . . .

The Author and the Prime Minister of Mongolia

Thousands of miles you may travel and no signs of life will meet your searching gaze. No tents, no droves of horses, no herds, not even some lonely rider will pass you. The sand brought there by the winds during thousands of years, have covered and separated this rich land from all cultured nations and even from its nearest neighbor, China.

This picture is a symbol of the Mongolia of to-day ; endless deserted steppes, utter hopelessness, dull despair and everywhere overgrown monuments of the past.

A mountain plateau forming the farthest outskirt of central Asia lying between 42° and 52° of latitude and 88°-116° longtitude. Surrounded by a chain of mountains in the east slopes down to the desert of Gobi. Thus, as a whole, Mongolia presents a country unusually complete in itself and separated by nature from the surrounding world. Out of the five-and-a-half thousand miles of Mongolia's boundary line over half is contiguous with Russia and the rest with China. Thus Mongolia is jammed in between two great empires, a fact which has greatly influenced the whole of its history. The maximum distance of Mongolia from north to south is about 1,000 miles and from east to west 2,500 miles, thus, the whole area according to the latest information, is roughly estimated at 1,500,000 square miles or greater than that of Germany, France and Great Britain.

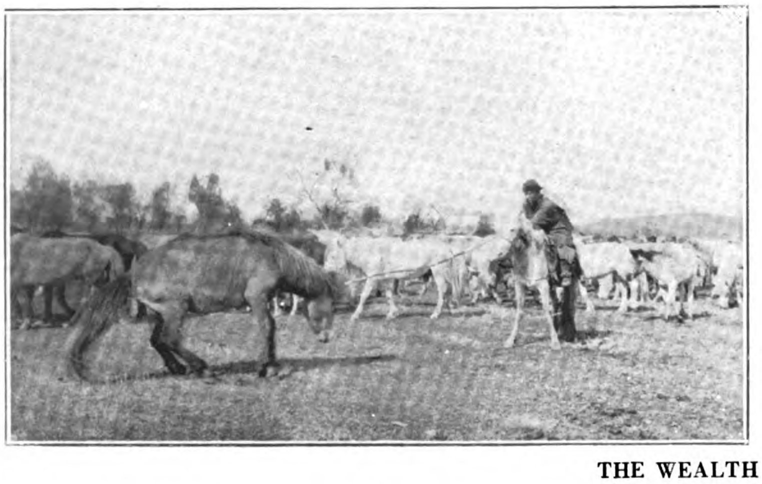
Mongolia is composed of mountain ridges, comparatively narrow valleys and deep gorges, through which flow rivers and in which lakes are embedded. Besides these, there are the sands and steppes. The Mongolian sands are the continuation of the centro-Asiatic desert Gobi, which are scattered in large areas over all of its south-western part. The eastern part however is covered chiefly with steppe-like plains, remarkable for their scarcity of water, some times for miles you may not meet either river or stream, not even the smallest lake is apparent, desert stretching to the horizon. The Mongolian soil is chiefly saline, sands, rocky loam or in a few rare rigions, black fertile mould.

The rivers and lakes are the chief irrigation system of Mongolia and chief among these are Keroulen, 750 miles in length, and the Selinga 540 miles in length. Both these rivers empty into the ocean. Some of the smaller rivers are : Tess 520 miles, Kobdo 360 miles and the Dzanhin 490 miles. The most important lakes are: Kosogol, Ubsa, Kirgis, Nor and Hara and Usu. Mongolian rivers are comparatively short and shallow, the lakes are small and are located mostly in the western part. This fact is very important and has no doubt had a great influence on the history of its people.

The great altitude of the territory, its insufficient irrigation, its distance from the sea and surrounded on all sides by high mountain ranges which intercept the moisture brought from the oceans, are the factors which determine Mongolia's climate.

Forests are few and we look in vain for something resembling the Taiga of Siberia. Grass, however, is found everywhere, in places exceeding man-height.

The domestic animals, camel, horse, cattle, sheep, goats, pigs, dogs and cats abound. Of wild animals the following only deserve mention : brown bears, wild dogs, the wild ass, the boar, the roe, the badger, the dox, glutton, lynx, wild cats, sable, ermine, squirrel, marmot and several species of antilopes. Marmots are met with in great quantities in high and dry regions, while the antelopes roam the mountains and valleys, some times gathering into large herds. Among the birds found in Mongolia are the eagle, hen-harrier (in limited numbers), swans, geese, ducks, cranes, field-ducks, pheasants, crows, daws, magpies and many other varieties of small birds. There are also found small snakes, lizards and salamanders. Finally of the fishes found in the Mongolian rivers these may be mentioned: salmon, chars, umbra, perch, pike, dace, osman and several others. As the Mongolians do not eat fish their numbers in some places are enormous.



THE WEALTH OF MONGOLIA

Mongol catching a pony with a noose on end of a pole

Sheep grazing on the outskirts of Kobdo

The many attempts to estimate the population of Mongolia are very unsatisfactory. According to the latest estimate the population is follows:

1.	Province of Han-Czozen	132,700
2.	Province of Han-Toutetou	145,450
3.	Province of Han-Sain-Noin	171,900
4.	Province of Han-Dzaktou	85,200
5.	Buddhist monks in the 4 provinces	72,350
6.	Lands of Bodgo-Gegen	17,200
7.	District of Kobdo	55,450
8.	Chinese	105,500
9.	Russians and other Europeans	5,000
	Total	790,750

Djan Dtak tu Wang, a Mongol Prince, with his dog and retainers

A High Mongol Lama

With an area of 1,150,000 square miles the average density of population is 51 per square mile with 42 per square mile of purely Mongol population.

The nomads who roam within the boundaries of Mongolia, are divided into several tribes, the chief among which are: Halhas 520,000, Durbats 47,000, Dzahalins, Mininggits, inhabitants of Urianchais and other. These tribes are divided into social classes as follows: Princes, nobles, freemen, serfs and the Lamas. The proportion of these classes is as follows: princes 1 per cent., nobles 5.6 per cent., freemen 26.2 per cent., serfs 16.6 per cent. Lamas 44.6 per cent., others, 7 per cent. It will be seen that the Lamas comprise nearly half of the entire population.

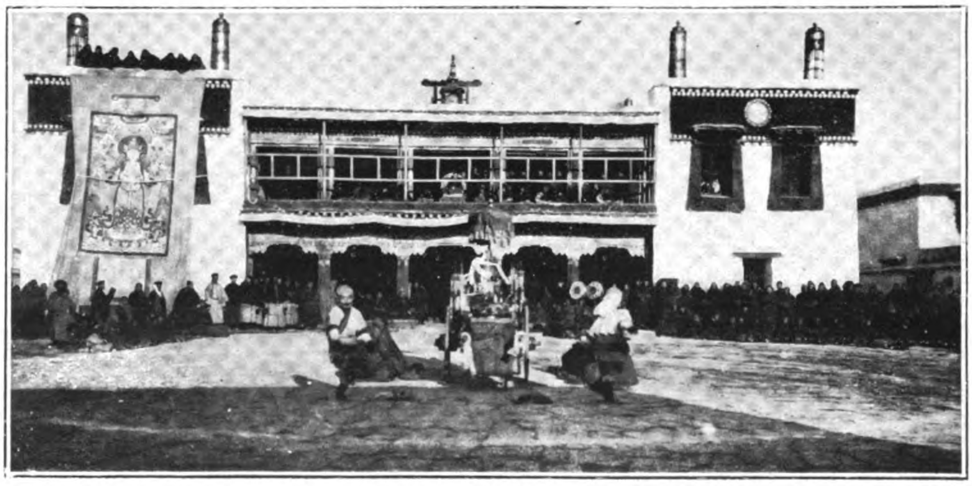
The Mongolians in general are of medium height, and strongly built. Their faces are broad with prominent cheek bones and a flat nose, the skin is light brown, a little darker than that of Europeans, their eyes black and very bright resembling narrow slits; their teeth are as white and shiny as mother-of-pearl, the ears stand out from the head, they have scarcely any hair on their faces. One very rarely meets a Mongol with either a beard or a moustache, the hair on the head is thick and black as a crow's wing. The difference between a man and woman is very hard to detect in Mongolia, since the men have no hair on their faces and their clothes are very much alike. It is often very difficult to know whether you have a man or a woman before you since both shave about half of their heads while the rest of the hair is braided into a tight plait behind.

Generally speaking the Mongol are a strong people and taking into consideration the hardships of their life, enjoy good health. However, the complete absence of culture and a nomadic life has resulted in a number of diseases many of which are infectious. The infant death-rate is enormous.

The chief traits in the spiritual outlook of a Mongol is his deep passiveness. The consequence of the physical conditions of the land and its history. The great distances, harsh climate, sterile soil, insufficient irrigation, poor vegetation and inhospitable deserts have left their impress on the people. The low economic status, the opposition to cultural growth, the rule of despotism in the inner political organizations of the tribes, the long periods of foreign rule and the very great influence of Buddhism have influenced their spiritual outlook.

Whether you take their government, their economic life, religious beliefs or their characters and customs, everywhere you will find this trait of submissive indifference. This is particularly noticeable in their mode of cattle raising. The Mongols are a shepherd-people. Their herds are their only possessions. Life and death depends upon their cattle. It would seem therefore that in their care of their herds they would spare neither time, strength nor energy. It would seem that through those thousands of years of pracical experience they would have worked out some elementary system for the care of their cattle and treating their various maladies. They have done nothing. The herds roam the year round about the wide steppes. The Mongols do not grow oats or barley; they do not build warm stables or sheds and the herds are exposed to the full rigors of winter. In consequence, hundreds of horses, oxen and

A Mongol Prince



A Lamasery in Mongolia

The Home of a Mongol Prince

A Mongol Yourt

A Mongol Encampment

sheep perish yearly of hunger, cold, snow-storms and spring tempests. Their veterinary knowledge is a pitiful collection of superstitions and in any more serious epidemi- they are quite powere less. For instance, at the time of the yearly plagues which decimate the cattle, the Mongols calmly sit by and passively watch their riches disappear, calling it a visitation ot God upon the people for their sins. The Russians introduced anti-toxines and earned the good-will of the natives. In addition to their apathy they are extremely lazy, time means nothing.

The Mongol lives in dirt and uncleanliness. The use of soap is unknown. His face and hands he sometimes rinses in cold water but his body is never washed, and in time his skin is covered with thick crust of dirt. The dresses worn by the Mongols are never washed. They are never taken off until they drop off themselves. Their bodies exude a specific perfume which causes a European to gasp. In their home dirt reigns supreme everywhere.

Excluding a few of the higher lamas and princes the ignorance of the people is abysmal. Strange and ridiculous superstitions influence their daily lives. Another trait is an extreme curiosity and thirst for knowledge. Some of their agreeable traits, however, are cheerfulness, good nature and hospitality.

The Mongol sex relations are extremely simple and astonish an outsider with their laxity. In their tolerence towards the birth of illegal children is seen the instinct of self-preservation in a people faced with slow extinction.

In order to complete this outline of Mongol character we must mention his honesty and above all his love of peace. And when, at the present time, we look upon these good natured cheerful herdsmen, who fear nothing more than bloodshed, it is difficult to believe that seven centuries ago their ancestors came down with blood and fire upon their neighbours and in a very short time subjugated almost half of the world and created one of the largest empires that humanity had ever known. How little is left of the past!!! This astonishing and unbelievable change is one of the interesting riddles of history which has not been solved so far.

Dutch Indies and Palm Oil

West Africa's greatest asset of palm oil is likely to share the fate of wild rubber at the coming of the plantation product, according to a report which Sir Hugh Clifford, the governor of the vast territory of Nigeria, has just placed before its legislative council to call attention to the competition of the Dutch East Indies in this product. At present the collection, preparation, and export of wild palm oil is still Nigeria's main industry, notwithstanding the rise of tin mining, cultivated shea and grond nuts, cocoa, and so on. No less than 200,000 tons of palm oil are exported annually from Nigeria alone, but that is far from representing its full capacity.

Large-scale palm oil planting has been going on in the Dutch East Indies since the war. Sir Hugh Clifford told his hearers that the trees would be coming into bearing shortly. By modern machinery, such as will be used in the Dutch East Indies, at least 90 per cent. of oil is extracted. On the other hand, the average yields of oil, all over West and Central Africa, by native processes, are 35 to 40 per cent. It is, moreover, as at present carried out by hand, an arduous process and would become much dearer if the women, who at present chiefly prepare it, should leave it to the men to do. Mechanical extraction also treasures a cleaner and better quality of oil than that won by native methods. In view of these facts, the governor of Nigeria offically advocated the erection of central factories by European capital, which could handle much larger quantities and on up-to-date lines.

South Manchurian Railway Projects

According to the president of the South Manchurian Railway Company, the sum of about 45 million yen will be available for various enterprises during the fiscal year 1924-25. This amount, which compares with 26,500,000 yen for 1923-24, has been allocated as follows: Railways, 15 million yen; harbors, 3,500,000 yen; mines, 3 million yen; ironworks, 7,500,000 yen; electrical undertaking, 3 million yen; gasworks, 1,200,000 yen; hotels, 1,500,000 yen; local administration, 8,600,000 eyn; and miscellaneous work, 2,200,000 yen.

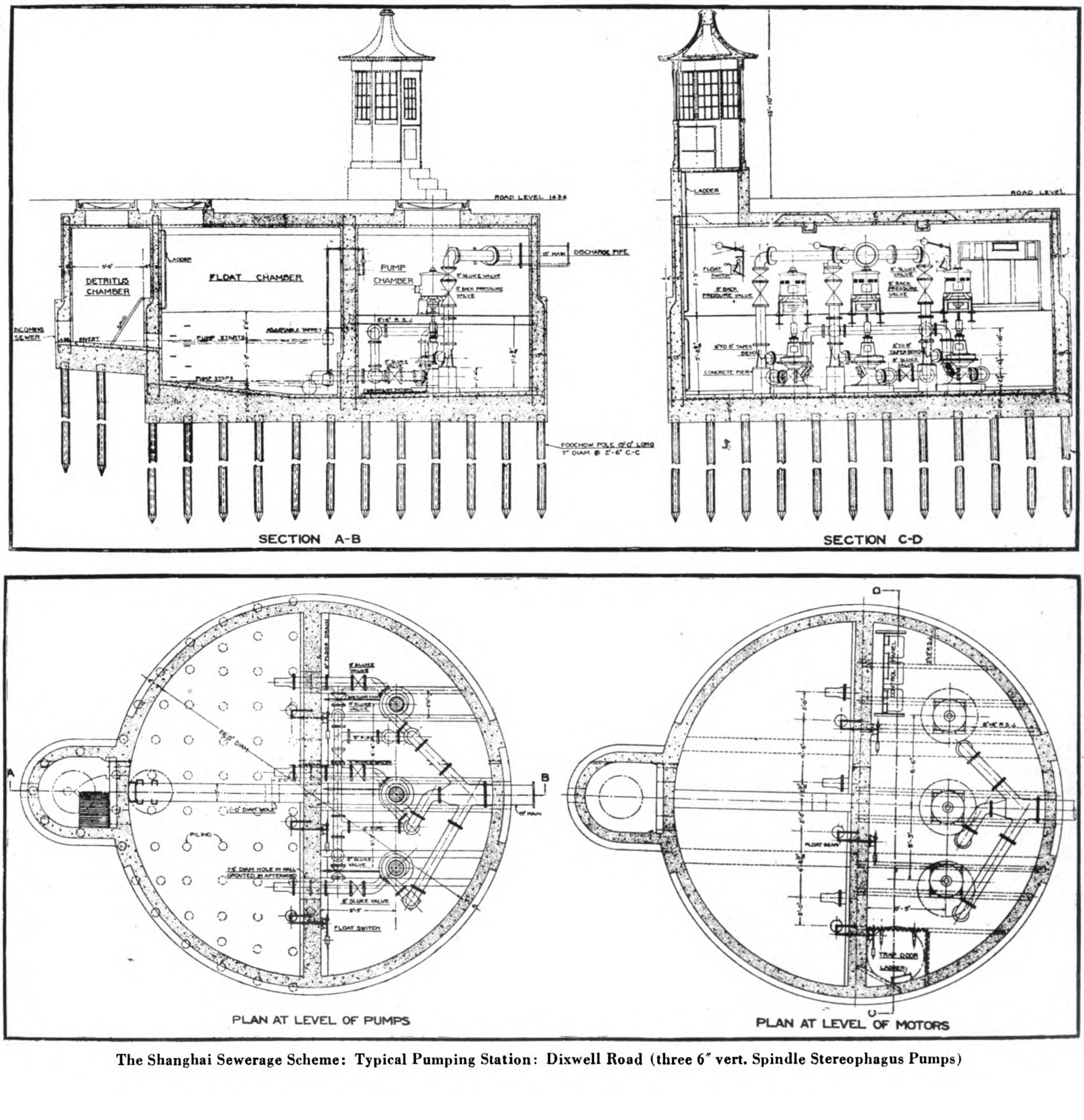
Design and Development of the Shanghai Sewerage Scheme

Paper Read Before The Engineeting Society of China

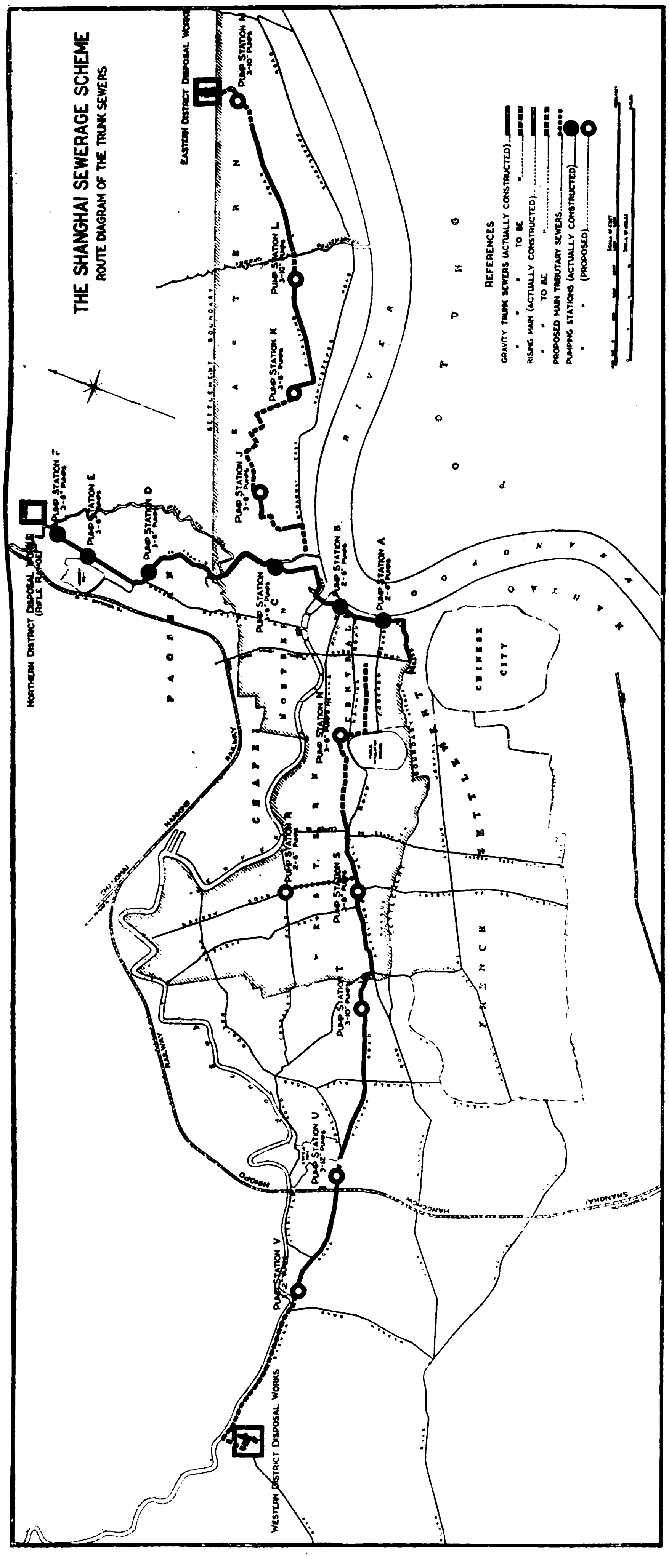
By H. W. Reah, M.C., Assoc.M.INST.C.E.

THREE years ago Mr. F. G. Helsby presented a paper on "The Present Aspect of Sewage Disposal with special reference to Shanghai," and the Council of this society has considered the lapse of this time sufficient reason to justify them in inviting another paper to deal with the development of the local scheme, the preliminary steps of which were briefly foreshadowed in the paper previously submitted.

Rather unexpectedly, and at somewhat short notice, the task and privilege of meeting this requirement has devolved upon the writer, and it is his hope therefore, that a more sympathetic consideration will be given to his efforts on this account.



The Shanghai Sewerage Scheme: Typical Pumping Station: Dixwell Road (three 6″ vert. Spindle Stereophagus Pumps)



At the outset it may be stated that the object of the paper is neither to reiterate the merits and demerits of the various methods of sewage disposal or their constructional details which have been discussed so freely by experienced engineers in recent years both in England and America, nor to make any references to the bio-chemical side of the subject. What is aimed at here is to endeavor to give some indication of the engineering and economic considerations upon which the scheme is based, and a somewhat general description of the works which have already been carried out and of those which are now contemplated to assist in raising the level of the sanitary facilities of this important and rapidly developing port to those existing in western communities.

Evolution of the Scheme

Mr. Helsby in his paper dealt with the sanitary conditions prevailing and traced the immediate causes which precipitated this scheme for sewage disposal, from the decision of the court of consuls in 1915 which gave property owners power to instal water closets in their buildings whilst holding them responsible for the removal of their contents. The work in practice was performed by the council, and the ever increasing activity in the provision of water closets and their consequent cesspools from this time onwards, necessitated the introduction of vacuum tank wagons to cope with a situation which was rapidly getting beyond the practical employment of the ordinary hand-pumps. In January 1921 the council decided to proceed with the construction of the first instalment of a modern sewerage system, as it was obvious that if the vacuum tank wagons were to remain the solution of the problem, a very large fleet of these expensive and undesirable vehicles would soon be required.

The method of dealing with the sewage on the inception of the proposed water-borne system of collection was a subject for expert opinion, and the advice of Professor Fowler, D.SC., F.I.C., one of the most eminent authorities in these matters, was sought and was embodied in his report to the council in 1918, in which he recommended the adoption of "The Activated Sludge Process."

Preliminary Experimental Work

The first attempt to treat sewage on these lines in Shanghai was dealt with at a small experimental works completed in July 1919 at Yangchow Road, the sewage being delivered there by the vacuum tank wagons. The fill-and-draw method of operating was adopted here, the supply of sewage being irregular. Subsequently, additional works were carried out to provide for experiments on continuous flow. The first of these, which receives the sewage from a water flushed latrine situated at Wayside wharf, and which is frequented by over 500 Chinese daily, was first used in June 1921.

The second, on the Kinnear Road estate, forms part of a complete miniature sewerage system, being fed by sewers from a group of 35 houses. An arrangement was arrived at in this case whereby the whole cost of the installation was borne by the Shanghai Land Investment Company, the council undertaking responsibility for maintenance only.

A third experimental works, on the continuous flow method, which is more generally favored for larger works, was constructed in December 1920 on the actual site at the rear of the rifle range on which it was proposed ultimately to lay out the first working scale plant. The condition of the sewage arriving at this latter experimental station was similar to that delivered to the original Yangchow Road works, being stale cesspool contents, and was discharged by the tank wagons into manholes near the entrance to the ranges from North Szechuen Road, gravitating from here to a temporary 2½-in. pump near the 500-yard firing point, and then again to a similar pump adjoining the tanks through a 3-in. galvanized iron pipe.

Conception of the Main Scheme

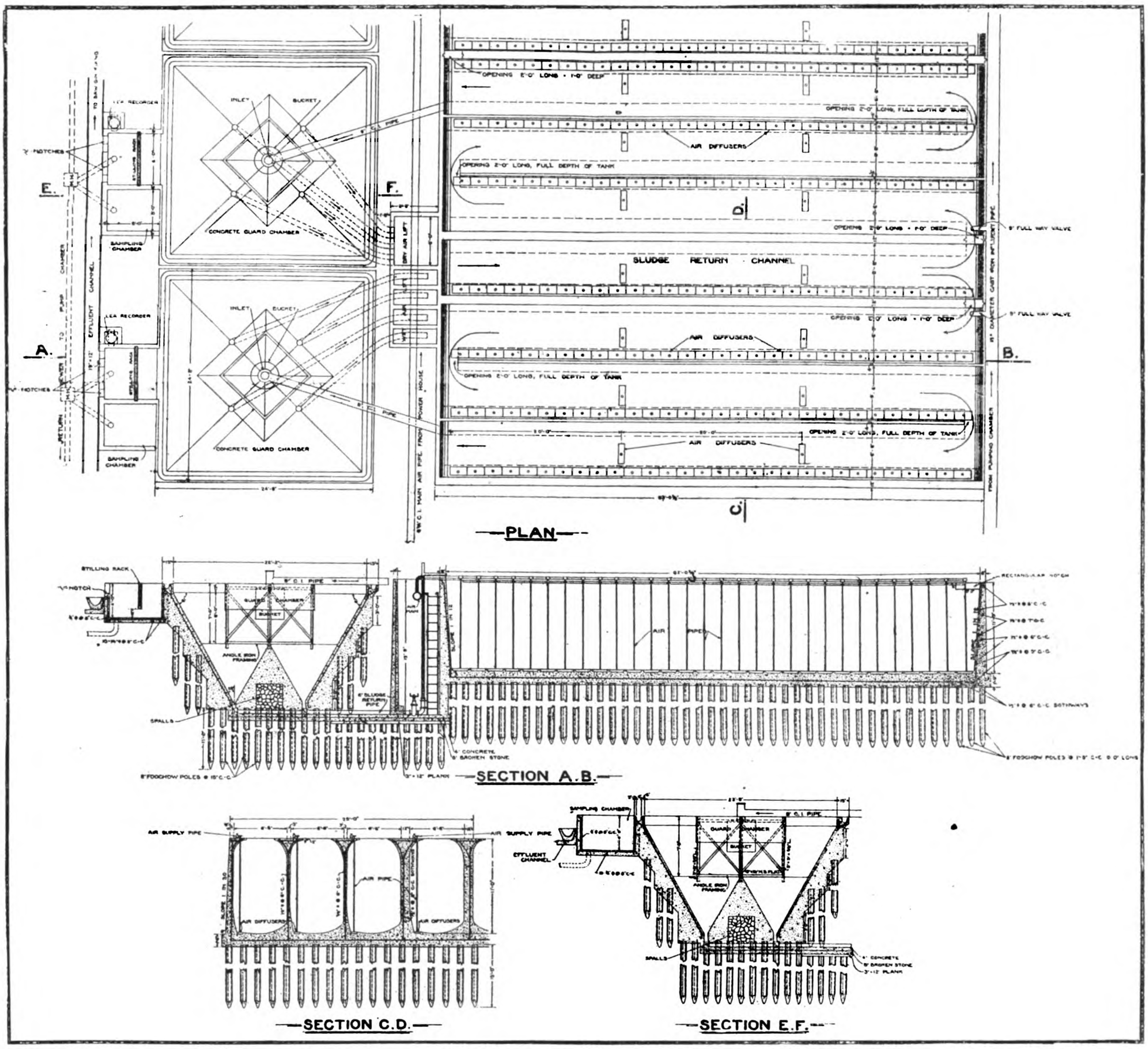
It was intended from the beginning that the finally developed scheme should be a comprehensive one to provide for the entire international settlement as existing, regard being also given to adjacent areas of potential development. The ideal arrangement of the layout of a sewerage system would normally be one to collect the sewage at one suitable site, in order to :—

1. Reduce the capital cost, maintenance and operating charges of the disposal works to a minimum.
2. Facilitate the control of the treatment of the sewage.

It was apparent, therefore, that separate works would ultimately be necessary for the eastern and western districts in the completed scheme.

First Section of the Scheme

The urgency of dealing with the business area of the central district east of Honan Road, however, coupled with the difficulty of obtaining a suitable site at a reasonable cost within settlement limits at which to treat the sewage from this area, resulted in the immediate selection, for disposal works purposes, of the area of land



The Shanghai Sewerage Scheme: Plan Showing Actual Development of Northern (Rifle Range) Treatment Works

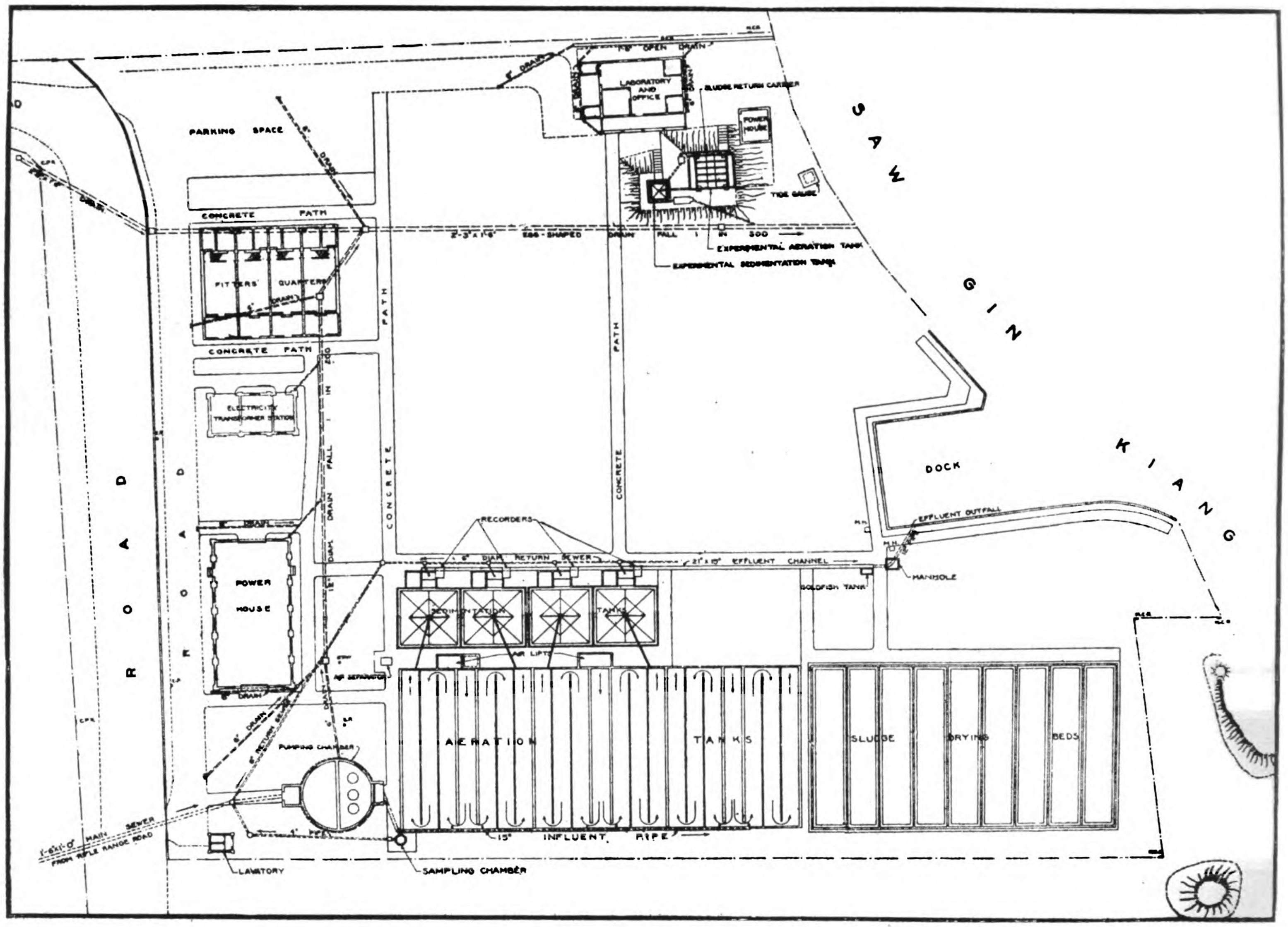
It would have been impracticable to discharge the whole volume of the local sewage to a single site, owing to a combination of the following factors :—

1. The prohibitive cost of land in or near the centre of the town assuming it were available, and that there were also no objection to treatment works being situated in close proximity to a highly developed area.
2. The great length of the settlement from east to west as compared with average width from north to south.
3. The extreme flatness of the ground throughout.

at the rear of the rifle butts which was already owned by the Council. This site, though perhaps not ideal, was considered favorably as providing both :—

1. A suitable outfall for the final effluent.
2. A ready means of disposing of the sludge.

This first section of the scheme is in reality self-contained, so that detailed consideration of it may be justified here before the whole layout is referred to, as it is felt that in this way a better appreciation of the " Development of the Scheme " will be obtained.



The Shanghai Sewerage Scheme: Plan and Sections of Aeration and Sedimentation Tanks

Calculation of Sewage Flow

The actual volume of sewage to be dealt with in a given time from a particular area cannot be determined with any degree of exactness, the most careful consideration giving results which can only be regarded as approximate. With a combined system of storm and soil water the problem usually resolves itself into a thorough examination of the watershed areas with special reference to rainfall, permeability of area, and the times of concentration of the flood water. The actual figures for the soil water would in this case influence the calculation a surprisingly small amount. The writer remembers, some years ago, illustrating diagrammatically the effect of converting an area from a privy to a water closet system to satisfy public anxiety re the ability of existing drains to carry the increased total volume of water. Even in the case of drains of small diameter, the added discharge from the water closets when the pipes were running half-full, was represented by little more than a line on the cross section to half-full size scale. This is mentioned because of the surprise expressed locally that most of the tributary sewers being laid were only 9-in. in diameter. With a system like that under review, however, where storm water is excluded from the sewers, the calculation of sewage discharge is none the less difficult.

The chief factors which have had to be considered here, are :--

1. The estimated water consumption for sanitary purposes per head of the population, both native and foreign.
2. The habits of the community as affecting the times of maximum flow and the percentage of the total daily discharge that this flow represents.
3. Thie estimated increase of population within the period of development assumed.

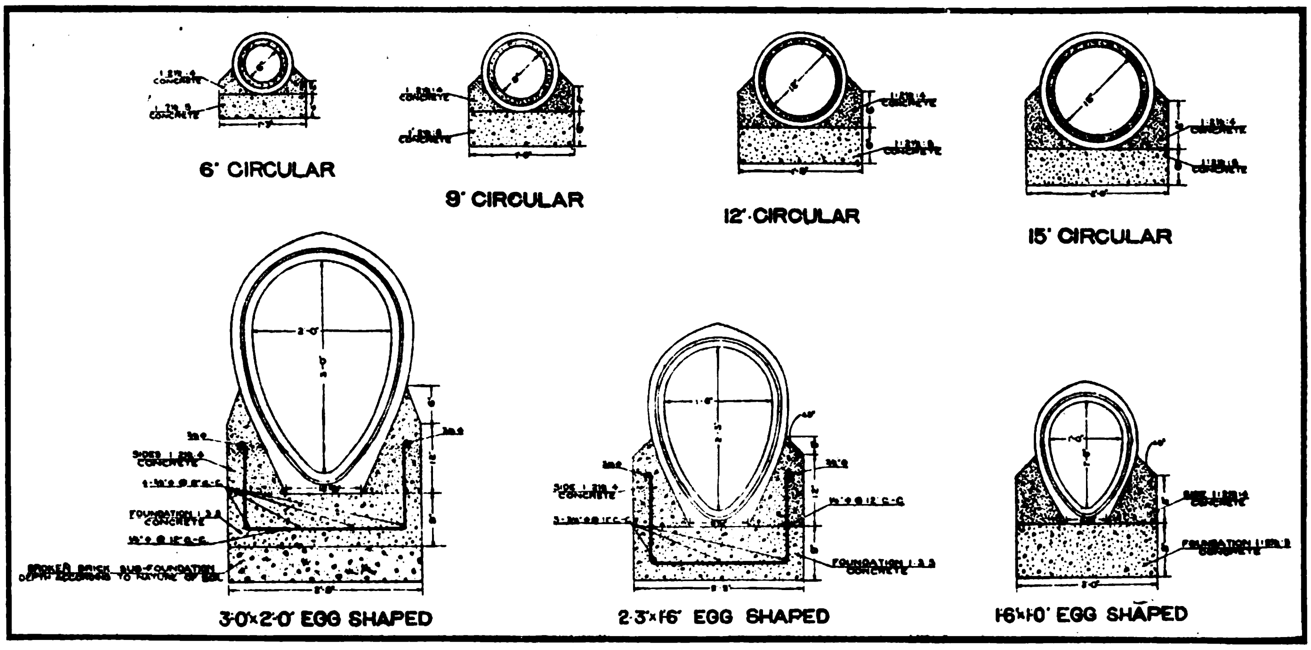
Preliminary ideas were gathered from a return of persons employed in a large number of the principal business premises in the eastern portion of the central district, and the assumption was made that ultimately similar development would take place in the remainder of this area. The daily influx of residents to this district from the outskirts, particularly from the west, was also important, this latter fact bearing on the question of maximum flow. The period of development assumed as a basis of calculation for increase of population has been taken as approximately 30 years.

The actual capacity of the rifle range treatment works as constructed to date is somewhat less than that which would be necessary to cope with the total sewage discharge from the portion of the central district previously referred to, and that from the northern district. The stay of the sewage in the tanks naturally influences this calculation, but normally, 1,000,000 gallons of sewage could now be dealt with per day, if necessary.

This amount, of course, is greatly in excess of present requirements, but the object is to be able to treat temporarily at this site part of the sewage which will later be dealt with at the proposed eastern and western disposal works. It will thus be possible for the vacuum tanks to discharge their contents into the northern trunk sewer at several points, which will enable these vehicles to gradually extend their usefulness by eliminating the more objectionable hand-carts.

First Main Trunk Sewer and Its Tributaries

The actual route followed by the trunk sewer from the Bund to these works is indicated in the diagram (Sheet 1), and the construction of it was commenced in April 1921. The portion between pumping stations A. and B. is 12-in. diameter, and the whole of the remainder of it right through to the disposal works is of 1-ft. 6-in. ×1-ft. 0-in. egg-shaped section with the exception of two lengths of rising main. The first of these latter sections is required to convey the sewage over the Soochow creek and the other, to convey it over the Hongkew creek and the Sawginkiang. The former is 1,250



The Shanghai Sewerage Scheme: Typical Cross Sections of Sewer Construction

feet in length, 812 feet of which is constructed of 12-in. concrete pipes encased in reinforced concrete 6-in. thick from pump station " B " at the end of Peking Road to the garden bridge; the remaining 438 feet being 12-in. C.I. socketted pipe carried under the eastern footway of the bridge itself. The latter pumping main is 3,115 feet in length, 151 feet of which is cast iron socketted pipe, 71 feet being 15-in. circ and 80 feet 17-in. × 12-in. oval section required for the approaches to, and the actual crossing of, the Hongkew creek at the new Hanbury Road bridge. Special provision was made in the design of this bridge for this pipe. The remainder of this pumping main is constructed of 15-in. concrete pipes similarly encased to those in the Bund, and extending along Dixwell Road and over the west side of the bridge over the Sawginkiang. The section crossing this creek is 114 feet in length, and is cantilevered out from the footway above the road level.

As the reconstruction of the Hanbury Road bridge was not sufficiently far advanced in March 1923 to lay the cast iron main in it; in order to avoid delaying the inauguration of the system, a temporary 6-in. galvanized iron rising main with screw union joints was carried over the creek a little to the north on a temporary timber trestle of 66 feet span. This was dispensed with in November 1923 when the larger pipe was laid.

The majority of the tributary sewers gravitating to the Bund as well as those in the northern district are of 9-in. internal diameter and have been designed to gradients which will give self-cleansing velocities throughout, viz., $2\frac{1}{2}$-ft. per second, though the initial additional velocity given at each pumping station has, in some instances, been taken into account as assisting in producing this velocity rather then adding to it. No natural fall being available, the importance of keeping the grades as flat as it is safe to do so, will be readily recognized, so as to minimise the number of times the sewage has to be lifted in its passage to the disposal works; pumping stations also incurring capital, maintenance, and operating expenses.

Pumping Stations

Appendix I is a schedule of the pumping stations that have actually been built and give particulars of the motors and pumps installed in them. The relative positions of the stations will be followed on the diagram.

With the exception of station " F " at the rifle range, they are all entirely underground and are constructed of reinforced concrete on Foochow pole pile foundations. The first to be proceeded with were those at the ends of Foochow and Peking Roads on the Bund and were commenced early in May 1922. The cofferdams were constructed of 12-in. × 6-in. Wakefield sheet piles 25 feet long, strutted with 12-in. × 12-in. Oregon pine. The majority of the stations are circular in plan, as shown on sheet II, which is station " D " on Dixwell Road and is a typical design. The Nanzing Road station is of special design, owing to the narrowness of the roadway—the float chamber being a long, narrow channel instead of being semi-circular as in the other instances.

A dividing wall separates the float chamber from the pump chamber proper, this latter chamber being divided into two in elevation by a chequer plate floor supported by rolled steel joists. The upper half accommodates the motors and switchgear, and the lower half, the pumps themselves. By standing primed automatic operation of the pumps is possible. Entrance is effected to the pump chamber at each station by means of a small kiosk built over a manhole, but station " F " has a storey entirely above ground, giving freer access and facility for observations. It would have been impossible, as well as being unnecessary, however, to provide this additional floor at every station, and ventilating shafts have been erected in lieu.

The well-known Parson's stereophagus pump has been installed thoroughout.

In each station one of the pumps is a stand-by in case of emergency and the others are designed to cope with the maximum flow that this sewer will ever be called on to discharge, allowing a reasonable margin.

Electricity supplies the motive power for the pumps and is delivered by underground feeders. In case of failure, an alternative supply is available from the ordinary distribution mains. Vertical spindle pumps were adopted instead of the horizontal type to allow of the motors being placed as high up in the chambers as possible.

The motors are started and stopped automatically by means of floats which are actuated by the rise and fall of the surface of the sewage in the float chamber, these floats being fixed at slightly different levels. The motor connected to the lowest float comes into service first, the others being brought into operation by the continued rise of the sewage due to the first one being either overpowered or failing to act.

In designing the pump stations, the surface area of the sewage in the float chambers has been kept as large as was practicable in order to reduce the variation in the level of the sewage, thus avoiding unnecessary lift. The suction pipes which are led through the dividing wall between the float and pump chambers have specially shaped ends to prevent floating obstacles, such as wood, from blocking the entrance to the pumps. Small detritus or screening chambers have been provided as an additional safe-guard against the choking of the pumps themselves.

In the remote possibility of a complete breakdown at any pumping station the float chamber in each is provided with a bye-pass by which the sewage could gravitate to the next pump station.

The level of the sewage in the float chambers is indicated in the pump chambers by the use of Liquid Level Recorders, and by which means a check is kept on the operation of the pumps.

Arrangements are now being made to have all the indicators installed at the Disposal Works and operated on the Bristols' Long Distance Electrical Transmitting and Recording System.

Comparison of Methods of Lifting Sewage

The various other methods of raising sewage were, of course, given due consideration before it was decided to adopt the stereophagus centrifugal pump, and of these, pneumatic ejectors, which have been successfully used under similar conditions elsewhere, proved the closest rival. The use of this latter method, however, would have necessitated either :—

1. Main air compressing stations involving long lengths of air mains that are liable to give trouble, or
2. A compressor at every pumping station.

The use of ejectors might also have entailed adequate provision being made for screening the sewage at the disposal works as it is very desirable, particularly with the activated sludge process, that the solids should either be removed or broken up as much as possible before the actual treatment commences.

The required lifts being low, there is no disadvantage under this heading in the use of centrifugal pumps, which have a distinct advantage in their power of disintegrating the sewage.

A major consideration in the selection of the pump to be employed, more particularly perhaps in cases like that under review, where every endeavor is being made to rigidly exclude all surface water, is that there shall be no possibility of the choking of the pumps through their failure to pass the fibrous and solid matters ordinarily found in the sewage. It is the ability of the type of pump adopted to do this which gives rise to its name " Stereophagus " (literally " an eater of solids "), and the result is obtained by a conical impeller with spiral blades working against a straight cutting blade.

Rifle Range Disposal Works

The general layout of the rifle range treatment works is shown on sheet III. The description of the cycle of operations carried out in the treatment of the sewage in the activated sludge process has previously been given very lucidly, though with particular reference to the experimental works. The principle, however, is precisely the same in the new works, so that repetition is unnecessary and only points of constructional detail need be dealt with here.

In brief, there are six aeration units and four sedimentation units. Each of the former consists of three channels 60-ft. long, 6-ft. 6-in. wide and 11-ft. deep with a similar channel between each set to convey the returned sludge from the sedimentation tanks back again for re-aeration. The volume of each unit is approximately 80,000 gallons and of each sedimentation tank 20,000 gallons. Sheet IV gives plan and sections of the first-two aeration units and two sedimentation tanks, one complete unit being first put into operation in December, 1922.

A row of " Filtros Plates " or diffuser tiles is fixed along the the bottom and at one side of each aerating channel the alternate ends of which are open the full depth of the tank to allow the sewage to continue on its journey. Parabolic curves have been introduced into the design of the cross section of the tanks, and the diffusers specially placed at one side in order to improve the circulatory motion of the sewage in its passage along the channels. Some transverse diffusers have also been put in to prevent short circuiting. The division walls of these tanks are only 4-in. thick, centrally reinforced, being merely partition walls, while the walls of the return sludge channel are 12-in. thick reinforced on the outsides, as each of these is called upon to act as a retaining wall when the adjacent unit is not being used. The sludge return channel is entirely enclosed except for adjustable rectangular notches over which the sewage flows to the units on either side. The sewage is fed to these tanks from the pump station " F " on the site through a 15-in. C.I. flanged pipe with full way valves at the required points of entry.

The sedimentation tanks are square in plan above ground level, the internal sides sloping inwards at an angle of 61°, the lower half of each tank being divided into four cone-shaped pockets from the apices of which 9-in. concrete pipes lead the sedimented sludge to the air lift chambers, in which it rises again to be discharged into the return sludge channel.

The constructional details of all these tanks are indicated on the drawings. Cast iron flanged pipes 9-in. in diameter convey the sludge from the aeration tanks to the sedimentation tanks, discharging into the latter by means of a special inlet, consisting of a vertical pipe under which a bucket is suspended. The bucket is surrounded by a square concrete guard box, built of angle iron framing supported on the ridges between the pockets to which reference has already been made. The object of this arrangement is to render the liquid inside quiescent facilitating settlement of the sludge and allowing the effluent to flow over the sill at the top of the tank Before the effluent from each set of tanks is finally discharged into the effluent channel leading it to the creek, it is passed through stilling chambers, so that its volume may be measured accurately by Lea recorders as it flows over V notches.

Three Ingersoll-Rand air compressors each with a capacity of 441 cubic feet of free air per minute are installed in the power house to provide the compressed air for both aerating and lifting the return sludge. A common C.I. flanged air main 8¾-in. diameter tapering to 6-in. serves both these purposes and is fitted with a Venturi meter and also a Stratton separator. The distributing air pipes along the tops of the aeration tanks are 2½-in. galvanized iron pipes, from which ¾-in. pipes of similar material are led through slots in the concrete hoods of the tanks down to the diffuser plates below. Needle regulating valves are fixed at the top of each of these vertical pipes. The sludge is lifted up to the aeration tanks in 4-in. galvanized iron pipes : the air being introduced into the bottom of these and under diffusers through ½-in. piping. At intervals the returned sludge, as it leaves the air lifts, is conveyed by means of a portable flanged pipeline on to drying beds formed of coarse sand which have adequate under-drainage. The liquid drains back to the pumping station, leaving the more or less solid product to be removed as soon as it is sufficiently dry to handle.

A dock 40-ft. wide and 70-ft. average length has been constructed on the creek for the purpose of disposing of the sludge by boat. Tongued and grooved reinforced concrete sheet piles 14-ft. long, 2-ft. 6-in. wide and 7-in. thick were driven 7-ft. to a slight batter and a concrete coping cast along the heads.

A transformer house and a laboratory have also been built on the site, and fitters' quaters are now nearing completion.

General Construction

The majority of the works have so far been carried out by direct labour, as it was considered that the pipework would be more efficiently executed by this means, and it was also desirable to be in a position to modify the details of the design of the treatment works from time to time as experience and later information directed.

Considerable difficulty in construction was experienced as a reault of water and the instability of the subsoil. The construction of the sedimentation tanks being the deeper, preceeded that of the aeration tanks. Typhoons in 1922 caused considerable damage to the cofferdams. Since completion, however, little or no settlement has taken place, though slight leakage from the first and second sedimentation tanks was noticed some time ago and was found to be due to damage sustained by the return sludge pipe under the tanks, but this has now been rectified.

Progress in the Construction of the Tributary Sewers

The whole of the central district lying to the east of Honan Road has now been sewered and with nine exceptions every building which up to the present has been dependent upon a cesspool has been connected up to the system. The majority of the sewers in the western half of the central district, south of Nanking Road, have also been laid. This work has entailed very considerable difficulty and required the most careful attention both in arranging the gradients so as to reach all points successfully and in avoiding as far as possible the necessity of making expensive alterations to the network of underground service pipes of the various utility companies. The available information regarding the position and depth of these existing mains was from a variety of understandable causes very often inaccurate, and rather extensive trial holes have usually been essential prior to excavating any particular line. The narrowness of the roads together with the great volume of traffic of every description which traverse them, and the fact that the trenches

were flooded at every high tide necessitating close sheeting, all contributed to slow down the rate of progress of the work particularly as every section of pipe was subjected to a water test before reinstatement of the roadway was commenced. The combination of these conditions in the construction of a sewerage system is probably unique.

Prospective Development of the Scheme

The attention of the department is now being directed to the provision it will be necessary to make for the northern, eastern and western districts. The sewage from the central district west of Honan Road, as well as the whole of that from the western district will travel to proposed disposal works situated approximately four miles west of Bubbling Well and close to the banks of the Soochow creek into which the effluent will finally deliver. The entire eastern district sewage will deliver to proposed disposal works to the north of the junction of Kueiyang and Hochien Roads, the effluent in this case discharging *via* Pingliang Road to the Whangpoo River.

The routes followed by the trunk sewers concentrating on these sites, and the proposed positions of pumping stations will be followed by again referring to Sheet 1, which is at the same time a progress plan showing the portions of the lines which have already been completed and those which have yet to be laid.

Western District Trunk Sewer

The western main sewer travels in a westerly direction from Honan Road *via* Hankow Road to Thibet Road, northwards to Burkill Road and along Burkill Road to Carter Road, thence *via* Yuyuen and Brenan Roads. The size of the pipes increases from 12-in. circ. up to pump station N; 2-ft. 3-in. by 1-ft. 6-in. Egg-shaped up to the junction of Carter and Bubbling Well Roads 3-ft. by 2-ft. Egg-shaped to the works. Under the Shanghai-Ningpo Railway Company's level crossing immediately south of Jessfield Railway Station, however, a 30-in. C.I. flanged pipe will be laid on a reinforced concrete foundation to obviate any possibility of breakdown which might occur as a result of damage to a 3-ft. by 2-ft. concrete pipe. The crossing of Fahwa creek will be effected by a 30-in. C.I. rising main from pump station " V " and a further section of rising main will be necessary at the disposal works.

Eastern District Trunk Sewer

The eastern district trunk sewer travels by a rather circuitous and zig-zag route from a point immediately to the east of the Hongkew creek at Broadway *via* Yuenfong, Tongshan, Singkeipang, East Yuhang, Chusan, Tongshan, Alcock, Kwenming, Paoting, Baikal and Dalny Roads to Pingliang Road and then along the entire length of this latter road to Kueiyang Road where it finally turns northward to the disposal works.

The route almost entirely avoids tramway tracks and meets with the minimum obstruction possible from underground sources.

The size of the pipes increases from 12-in. in Broadway up to Yuenfong Road 2-ft. 3-in. by 1-ft. 6-in. up to Tsitsihar Road and 3-ft. by 2-ft. from this point to the disposal works. Approximately 1,000 feet of 24-in. diameter rising main will be required from pump station " L " to cross the Yangtszepoo creek, the portion of this actually crossing the creek will be of cast iron pipes and like the main over the Fahwa creek will most probably be carried independently of the existing bridge to avoid difficulty when the time comes to widen this structure.

Proposed Pumping Stations

Appendix II is the schedule of the additional pumping stations which it is estimated will be necessary when the whole settlement has been sewered.

Tenders have already been invited for the supply of the motors and pumps for these, with exception of stations " G " and " H " in the northern district and " O," " P " and " Q " in the western district. These have been omitted as it will be a considerable time before they can be dealt with, and their positions have not been indicated on the diagram, firstly, so as not to complicate this unnecessarily and secondly, because circumstances may require the selection of alternative sites.

Eastern and Western Disposal Works

Though it may be premature to make any very definite statements regarding the design of these works it may perhaps be permissible to draw some comparison with those existing at the rifle range.

Lay-out plans of the proposed new works have been completed and as soon as the working drawings, which are in preparation, have received necessary approval the construction of as much of the work as will meet existing requirements will be proceeded with.

At each site these preliminary tanks will have a capacity of approximately 1,500,000 gallons a day. The estimation of the total tank capacity that will ultimately be required and the date at which the necessity for it will occur, are factors even more difficult of solution than in the case of the northern works. The capacity of the pumping stations which will deliver the sewage direct to each works, however, will be approximately 9,000,000 gallons a day.

Both the length and cross section of the aeration tanks will be greater than those at the rifle range, the proposed dimensions being 120-ft. long and 9-ft. wide with 11-ft. depth on the diffuser tiles. Transverse baffle walls will be provided to avoid short circuiting in these very long channels if the need arises. There will be only one set of air lifts for each set of tanks and consequently only one return sludge channel. An emergency channel along the ends of the aeration tanks, however, will make it possible to direct the returned sludge into any aeration unit, whilst a second similar channel along the other ends of the aeration tank, and between these and the sedimentation tanks will deliver it to any of the latter tanks desired. Additional stilling chambers will also be introduced to control the flow to these tanks.

This flexibility in the use of the tanks is a distinct advance on the arrangement at the rifle range works by which the sludge from any sedimentation tank can only be returned to one of two adjacent aeration units. The emergency channel can also be utilized to drain any of the aeration channels at any time. In this case the liquid is carried back by an underground pipe to an auxiliary pump which lifts it into a distributing chamber where it will mix with the incoming sewage and be discharged again to the desired aeration unit.

Another change in design is of particular interest as being the direct result of practical experience gained on the present works. This is the proposal to bring the return sludge pipe from the bottom of the pockets in the sedimentation tanks, up through the tank walls into a small chamber about ground level, thereby serving the dual purpose of controlling the return flow and preventing any possibility of trouble caused through choking of the pipes.

It is proposed to construct these disposal works by contract.

Cost

No account of the design of an engineering scheme would be complete without some reference to cost and it is regretted that the time available for preparation of this paper has been insufficient to be able to give much detail under this heading. The yearly appropriations for the scheme included in the budgets since 1920 and the actual sums spent are of interest, however, and are given in the following table:—

Year.	*Appropriation.*	*Actual Expenditure.*
1920	Tls. 30,000.00	Tls. 7,623.01
1921	„ 150,000.00	„ 212,793.08
1922	„ 502,000.00	„ 493,838.60
1923	„ 538,700.00	„ 514,281.47
	Tls. 1,220,700.00	Tls. 1,228,536.16

It is understood that an opportunity will be afforded the members of this society at an early date of visiting both the council's concreteware yard where the whole of the pipes are manufactured, and the rifle range disposal works, and this it is hoped will serve to render the paper more explanatory.

Both the paper and the drawings which accompany it are submitted with the permission of Mr. C. Harpur, the commissioner of public works.

APPENDIX I.

SCHEDULE OF PUMPING STATIONS CONSTRUCTED.

Pump Station.	Position.	Number and size of Pumps installed.	H.P. Motor (each).	B.H.P. absorbed (each).	Revs. per min.	Total Head.	Discharge gals. per min. (each pump)
"A"	Bund opposite end of Foochow Road	2—4" Pumps	3	2	700	8	300
"B"	Bund opposite end of Peking Road	2—6" „	15	12	725	29(22 Friction (7 Lift	800
"C"	Corner of Nanzing and Hanbury Roads	3—6" „	15	10	725	23(15 Friction (8 Lift	800
"D"	Dixwell Road 134 yds. E. of N. Szechuen Road ..	3—6" „	6	4	570	7	800
"E"	Rifle Range (near 500 yds. firing point)	3—6" „	6	4	570	6	800
"F"	At Rifle Range Disposal Works	3—6" „	15	9	720	20	800

APPENDIX II.

SCHEDULE OF ADDITIONAL PUMPING STATIONS REQUIRED TO COMPLETE THE SCHEME.

Pumping Chambers.	Location.	Number of Pump.	Size of Pumps (inch).	Lift Head (ft.)	Friction Head (ft.)	Total Head (ft.)
"G"	N. Chekiang and Alabaster Roads (probable) ..	—	—	—	—	—
"H"	Boone and N. Shanse Roads (probable)	—	—	—	—	—
"I"	Quinsan and Chapoo Roads	3	6	14	Nil	14
"J"	Chaoufoong and E. Yuhang Roads	3	6	14	„	14
"K"	Wayside and Dalny Roads	3	8	14	„	14
"L"	Pingliang and Tsitsihar Roads	3	10	23	2	25
"M"	Pingliang and Kueiyang Roads ..	3	12	20	5	25
"N"	Thibet Road	3	6	14	Nil	14
"O"	Avenue and Chengtu Road (probable)	—	—	—	—	—
"P"	Mohawk and Weihaiwei Roads (probable)	—	—	—	—	—
"Q"	Gordon and Robison Roads (probable)	—	—	—	—	—
"R"	Gordon and Connaught Roads	2	6	14	Nil	14
"S"	Bubbling Well and Seymour Roads	3	8	13	„	13
"T"	Yu Yuen Road opposite Public School	3	10	13	„	13
"U"	Yu Yuen Road near Railway	3	12	14	„	14
"V"	Brenan Road near Fahwa Creek	3	12	19	1	20
"W"	Rubicon Road Disposal Works ..	3	12	21	2	23

Huge Order for Converters

According to advices from the Japan office of the Westinghouse Electric Intl. Co., the imperial Japanese government railways have just placed an order for sub-station equipment covering twenty 1,000 k.w. rotary converters, to be operated two in series on 1,500 v., and two 2,000 k.w. motor generator sets, 1,500 v. d.c. with automatic switching equipment.

These latter machines are for their main line electrification and will represent the largest motor generator set installation with automatic switching in the world. Westinghouse already had the largest rotary converter installations with automatic switching in the world, namely, the 8,000 k.w. station for Yokohama, which will supply the I.G.R. main line.

Anzan Cement Slag

Whether the new materials to be used in the Anshan Iron and Steel Works will render the slag unfit for cement manufacture is a question, says Mr. T. Oka, general manager of the S. M. R. Co. development works department, regarding the proposed transfer of the slag cement factory on the premises of the iron works to the Onoda Cement Co. (Dr. S. Kasai, president), operating a plant at Choushuitzu. The Anzan works originally planned to operate the slag cement plant as a by-industry, in order to supply the railway company's demand for cement.

The prospective change in pig iron manufacture in the new plant provides for the use, instead of lime stone and silicious stone as now, of dolomite ingredients occurring about Tashihchao. In such case, the slag will contain magnesia, etc., which may unfit it for cement manufacture. Therefore, nothing definite can be stated before the slag has been subjected to chemical analysis. On such premises, an understanding has been formed with the Onoda Cement Co., undertaking to render suitable support, in case of the new slag being found still available for cement manufacture.

Manchuria, Supplier of Blast-Furnace Charges

The Imperial Japanese Steel Works at Edamitsu receives from Manchuria through the S.M.R. Co. silicious stone, magnesite, and fire-clay required for its blast-furnaces. The works also owns a magnesite quarry in the Kwantung leased territory. The amount imported annually is 10,000 tons of silicious stone and as much fire-clay, besides two to three thousand tons of magnesite and 20,000 to 30,000 tons of dolomite. The government works often draws on Buzen and Tanba provinces for silicious stone, the outputs of which are of superior quality, but very dear in price, being quoted at from Y.13 and Y.8 to Y.5 per ton. The Manchurian product can be obtained at Y.3.50 per ton f.o.b. Port Arthur.

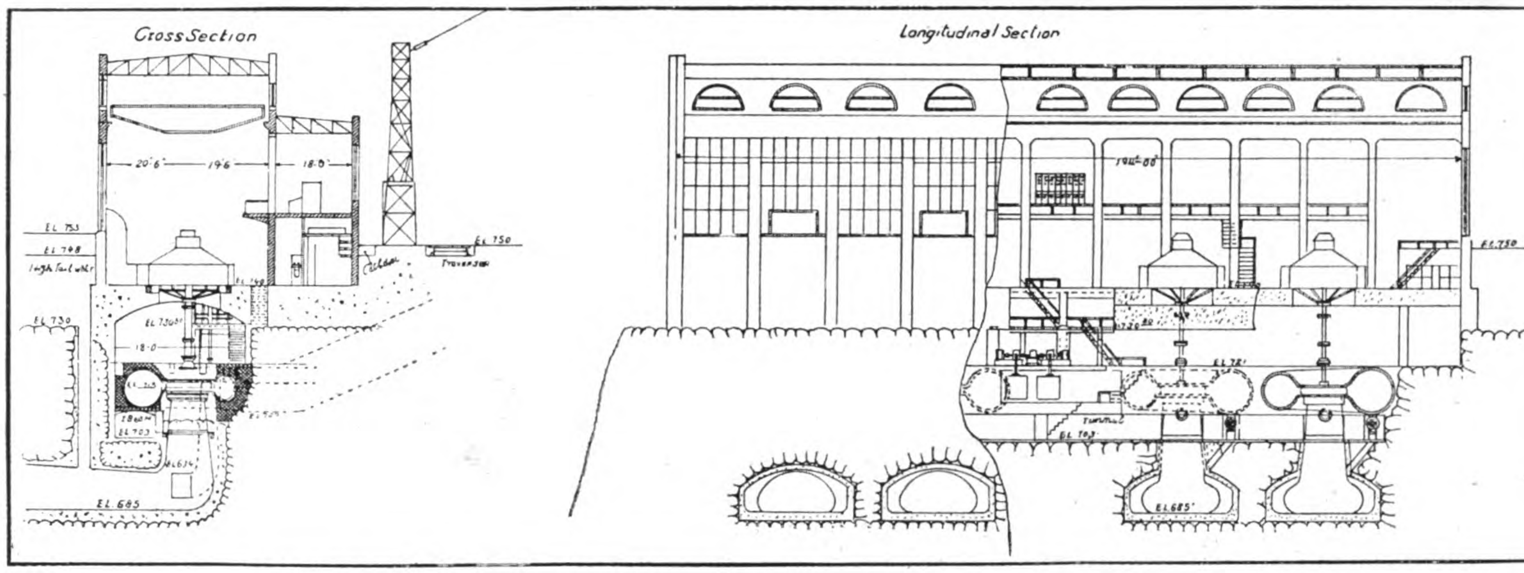
The fire-clay procured from Manchuria is excellent in quality, suitable for the manufacture of Al brick.

Dolomite is found in abundance everywhere about Port Arthur and Dairen. The deposits of silicious stone and dolomite in Manchuria are exceedingly thick-seamed, often reaching 3,000-ft., compared with only several hundreds of feet in Japan.

Magnesite occurs in great abundance about Tashihchiao. It serves as material for making paint and lignoid, promising more extensive possibilities.

The Edimitsu blast-furnaces comprise 12 of 25 tons each, 8 of 50 tons each, and the same number of 60 tons each. For making pig-iron, four furnaces of 250 tons each and two of 300 tons each are provided. The annual steel producing capacity is 420,000 tons.

The management of the works is looking forward to a sharp increase in the demand for slag-cement and proposes to increase the present daily production of 200 barrels to 2,000 barrels.



Ohi Power Station: Equipped with four 18,000 h.p. (max.) 180 r.p.m. single spiral, single discharge, vertical type Allis-Chalmers water turbines and four 13,750 k.v.a., 80% P.F., 6,900 v., 3 phase, 60 cycles, General Electric alternators

The Ohi Hydro-Electric Power Plant

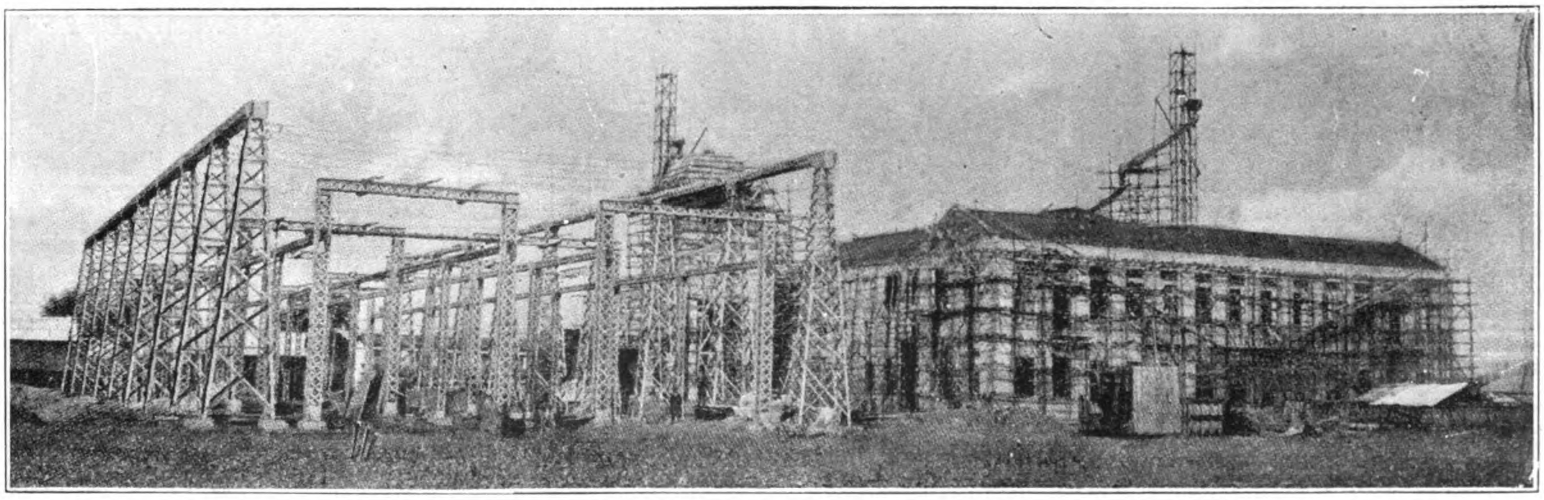
By Ernest V. Pannell

ONE of the most remarkable cities in the world is Osaka, in Japan, which unites history and tradition with modern industrial development, finance, and economic prestige. Whilst Tokio is the capital of the empire, Osaka will always be more representative of the new Japan, of factory, exchange, and shipping-dock. No visitor can fail to appreciate the significant part in the life of this city of nearly two million souls within which not only is virtually every room in every house electrically lighted, but the use of illuminated signs is apparently more widely spread than in most of the cities of the western world. A network of electric car lines covers every part of the city and links up with high-speed electric lines of heavier types operating to Kobe, Kyoto, Nara, and other points at a wide radius.

It should be admitted that Japan was quite early in the field of electric light and power development, for nearly thirty-five years ago the first electric light was produced in Osaka, and the first Japanese electric railway was initiated six years later in Kyoto. Hydro-electric power was introduced in 1891 and high-pressure transmission in 1898. It will not be surprising to learn, therefore, that modern Japanese development in electrical engineering is, at least, equally as advanced as anywhere in the world. At the present time it is estimated that our of seven million available water horse power (based on minimum flow), one and a half millions is being harnessed to produce electricity.

Probably the most extensive power corporation in the island empire is the Daido Electric Power Co., which supplies the city of Osaka, together with Nagoya, Yokkaichi, Kyoto, and, through its affiliations, Toyama, Kanazawa, and other cities on the remote northern shore of Hondo, the central island of Japan. The Daido Co. represents the amalgamation of a number of power interests in contiguous territory under the capable financial direction of Mr. M. Fukuzawa. The business of the company is to generate electricity at the various falls of the Kiso River and elsewhere, and to sell the power mainly in the Osaka district. The capital of the company as at present subscribed is approximately £4,500,000 in preferred and ordinary shares, plus £3,000,000 in debentures, paying 7 per cent. At the time of writing, the total connected load on the system approaches 200,000 kva, and construction is in progress to increase this amount by 50 per cent.

The bulk of the power is generated on the Kisogawa, one of the " four great rivers " of Japan, there being no fewer than twelve installations of plant operating, or being constructed at different points along the valley, all having an average head of 150-ft. and having outputs rated at from 4,000 to 45,000 kw. (Ir should be remarked that, by virtue of the code of the Japanese federal

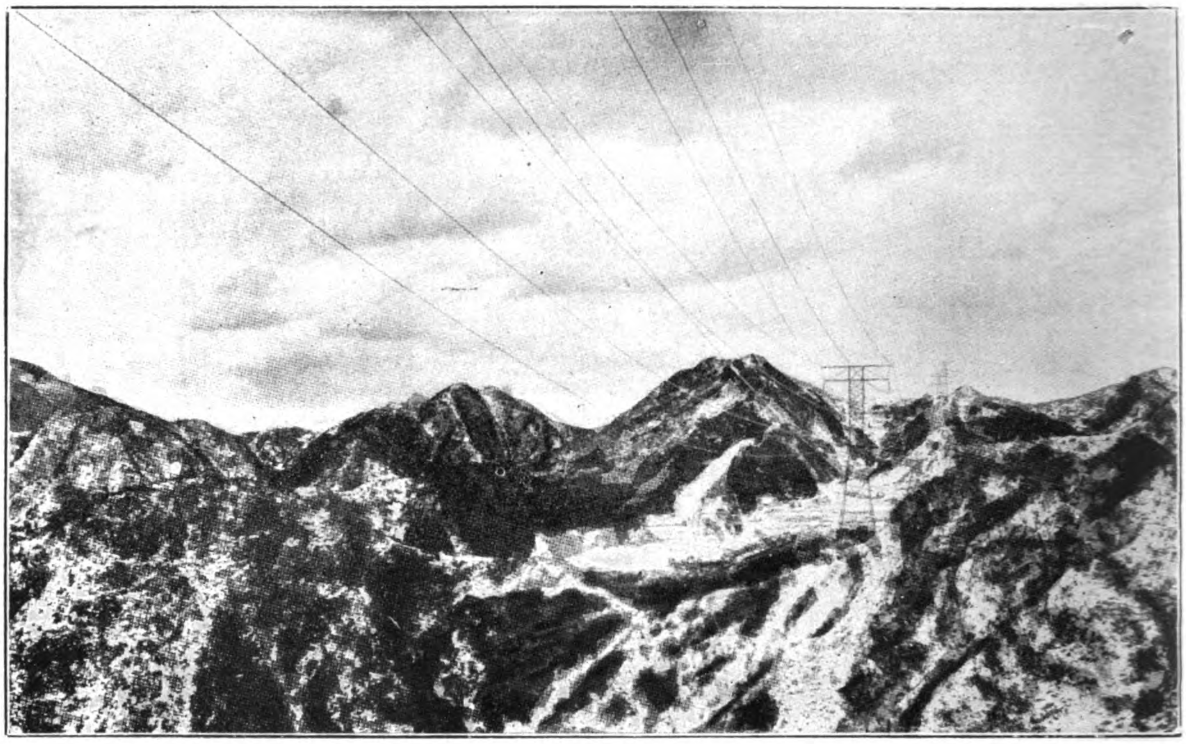


Recently Completed: Osaka Sub-Station under Construction; output 120.000 K.W.

department of communications, the plant capacity is 25 per cent. greater than the rated capacity of the stations, this margin representing a reserve.) This disposition of a series of stations along the same river provides for development at a reasonably low cost, and, although the extreme sets of plant are 75 miles apart, it can truly be said that the tail-race of one station provides the head water of the next. Midway in the chain of stations lies the Ohi power house, with a capacity of 44,000 kva, and now just being completed. At this point the effective head is 140-ft., provided by a dam 180-ft. high, built of cyclopean masonry, and a pressure tunnel 3,000-ft. long, yielding a discharge of 4,500 second-feet.

The Ohi equipment comprises four Allis Chalmers-General Electric sets providing 56,000 kva at an 80 per cent. power factor, 66,000 volts, 3 phase, 60 cycles. Two banks of Westinghouse transformers are connected to the 6,600-volt busbars to step the pressure up to 154,000 volts; they are connected delta to star with an open neutral, whilst an extra bank is in reserve. This great proportion of spare plant is characteristic of Japanese construction, and seems to indicate too extreme a conservatism. It will be noticed, however, that the high-pressure neutral point is unearthed, and damage to apparatus cannot fail to be more prevalent for this reason. Japanese practice leans towards undue protection of telephone and telegraph circuits at the expense of power lines, and for this reason the neutral point of the "Y"-connected high-pressure circuits may not be connected directly to earth. There is a tendency among the engineers of the present 154-kv lines to insert a Peterson reactance coil in the earth connection, and it is believed that this device will drain the system in the event of a bad short circuit without giving rise to interference with signal lines; at any rate, the reactance coil will be better than an insulated neutral point, though not so satisfactory as a solid earth connection.

All the power stations on the Kiso River are tied together by means of a 77-kv line, which also taps other sources of power. In the more recent installations of plant, the transformers are wound for 154 kv, and a double-circuit tower line at this voltage connects Suhara (the main switching station for the Kiso sets of plant) with Osaka, a hundred and fifty miles away. This is one of the most substantial and up-to-date high pressure lines recently constructed; the towers are 80-ft. high, weigh about 800-lb. each, and are spaced at an average of 800-ft. apart. Ten unit suspension insulators are used as standard, and each string is suspended from a link to increase the mechanical flexibility and to permit the ultimate increase of voltage by substituting two or three more units. The bulk of the conductor material is 37 strand copper of about 0.40 sq. in. section, but in the mountains, where the critical corona voltage is lower, there is a tendency to use a larger conductor by way of compensation. For this reason quite an appreciable mileage of steel-cored aluminium wire is now being strung on the line. Some sections of the line cross exceedingly rough country, and the use of such reinforced cable makes it possible to string a longer span and so reduce the construction cost.

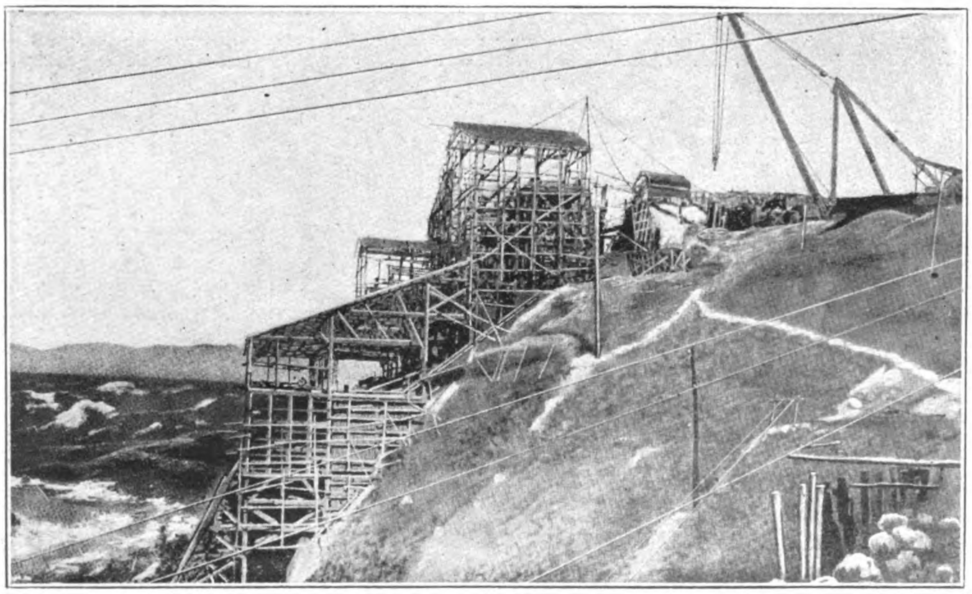


Transmission Line of the Daido Electric Power Company: Tower near Kameyama, midway between Nagoya and Osaka on 154,000 volt, 96 mile Transmission Trunk Line. Elevation at this point, 1,000 feet.

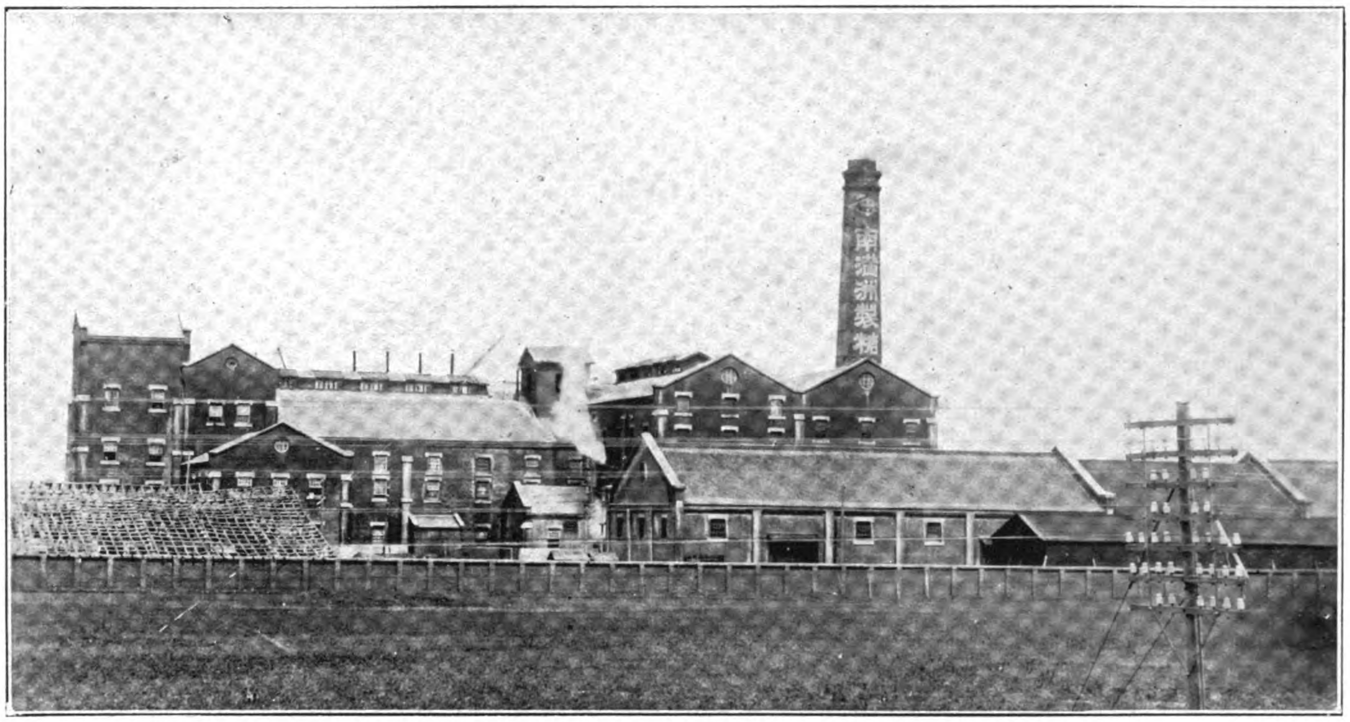
Few localities offer more difficult constructional problems than the average Japanese terrain. The mountains are, on the one hand, high and steep and intersected with deep gorges; on the other hand, the lowlands are given over to rice cultivation, and are almost permanently flooded. Rivers are extremely wide and swift and have unsound banks, while, added to these factors, is the constantly-recurring earthquake which yields sensible tremors at least twice a month. Line construction is therefore costly; concrete anchors are almost universally employed; towers must be built up in sections instead of being hoisted ready assembled; wire can be pulled in but slowly, as it is generally submerged in the swampy ground. For these reasons great credit is due to the Japanese engineers for keeping the construction cost as low as it is.

Near Osaka the 150-mile line terminates in an open-air sub-station, which is one of the greatest in the world, its present capacity is about 140,000 kva, but ultimately it will be able to handle 500,000 kva. There is a 140-kv ring busbar arranged to connect with up to 20 incoming circuits, each with its own switches, transformers, and protective devices. The transformers are wound for 154 kv, but have a tertiary winding for 50 kv for local transmission to the distributing companies' sub-stations, as well as a secondary winding for 11-kv delta connection. There are at present six banks of transformers, each bank approximating 28,000

(Continued on page 283)



Concrete Mixing Plant for Constructing the Ohi Power Plant Dam.



Mukden Beet Sugar Factory of the South Manchuria Sugar Company, Limited

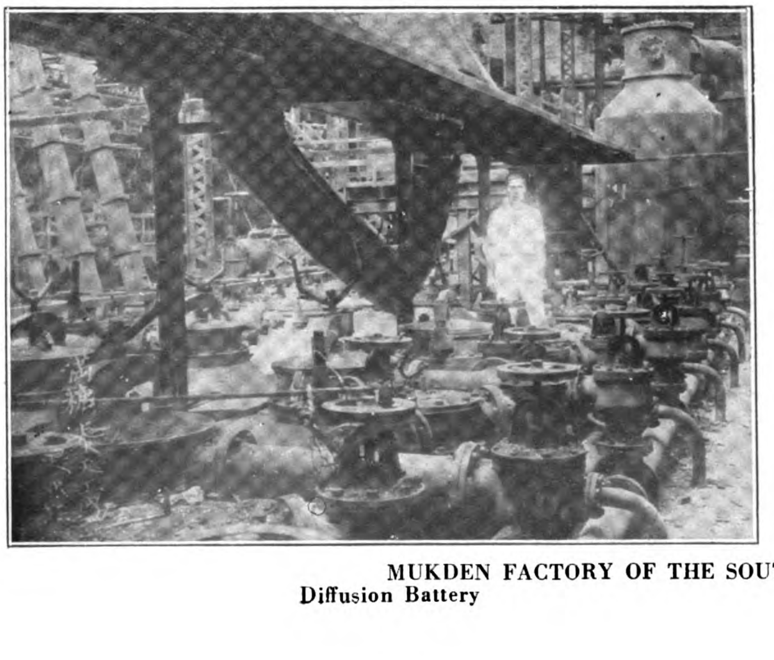
Manchurian Beet Sugar Industry

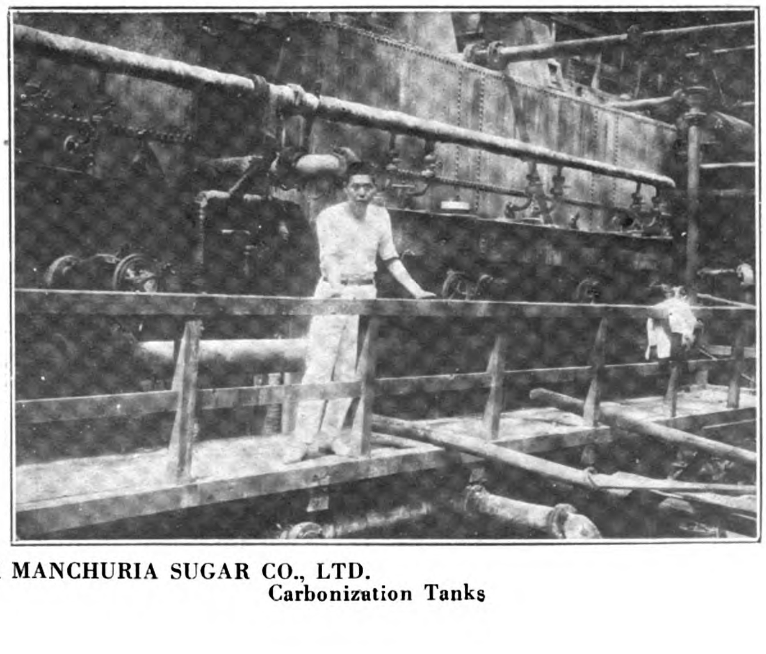
A REPORT of the Chinese government bureau of economic information says that the soil of certain districts in Manchuria—especially in the vicinity of Mukden and Harbin—is especially suitable for beet growing. Polish merchants were the first to exploit the industry for the production of sugar, and in 1909 established a factory near Ashihho station on the Chinese Eastern Railway in the neighborhood of Harbin. Beginning with a capital of a million roubles, the enterprise prospered after two or three years' depression, and considerable progress was attained by 1919, when the company was adversely affected by the depreciation of the rouble. At that time the capital was a million and a half roubles.

Soon after initiation of the Ashihho factory, several Chinese merchants founded a company which centred its activities on the Makia wharf, Hulan, which is on the Sungari River close to Harbin. Lack of funds, however, necessitated a loan from the government for the purchase of machinery. Still no progress could be made, and in 1912 the provincial governments of Fengtien, Kirin, and Heilungkiang undertook to repay the loan and operate the factory. For a short period the venture gave promise of improvement but bad management eventually caused its failure, work being entirely suspended in 1918. Latterly it mortgaged to a German firm.

Meantime the Japanese had been conducting experiments in the vicinity of Mukden, and in 1918 the preliminary investigations resulted in the formation of the South Manchuria Sugar Manufacturing Company. Its operations included the manufacture of beet sugar, refined sugar, and alcohol. The authorized capital is ten million yen, of which nearly half is paid up. 25,000 *mow* of land from the producing area, and all the plantations are the property of the Chinese farmers in the vicinity. The relation between the firm and the farmers is established by means of a contract, renewable yearly, whereby an undertaking is secured for the cultivation of the beet and the monopolisation of the output by the South Manchuria Company.

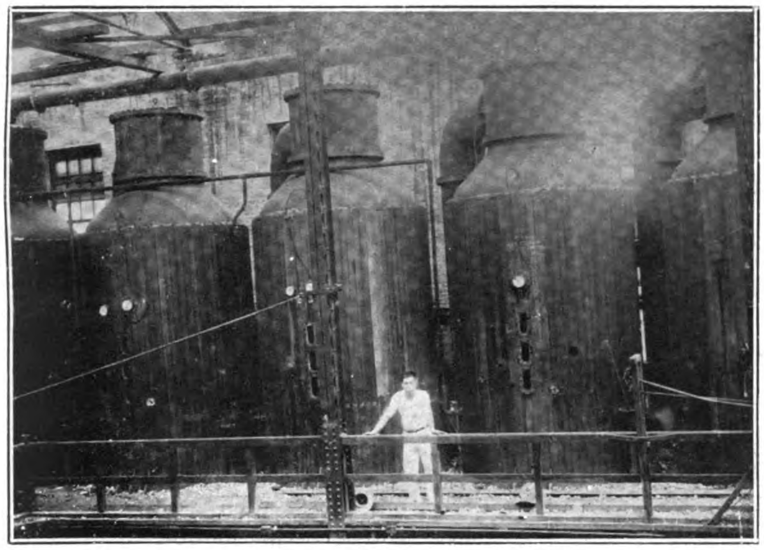
The South Manchuria Company employs Japanese machinery for manufacture of sugar, but the other two companies obtained their plants from Europe, the Hulan factory operating German



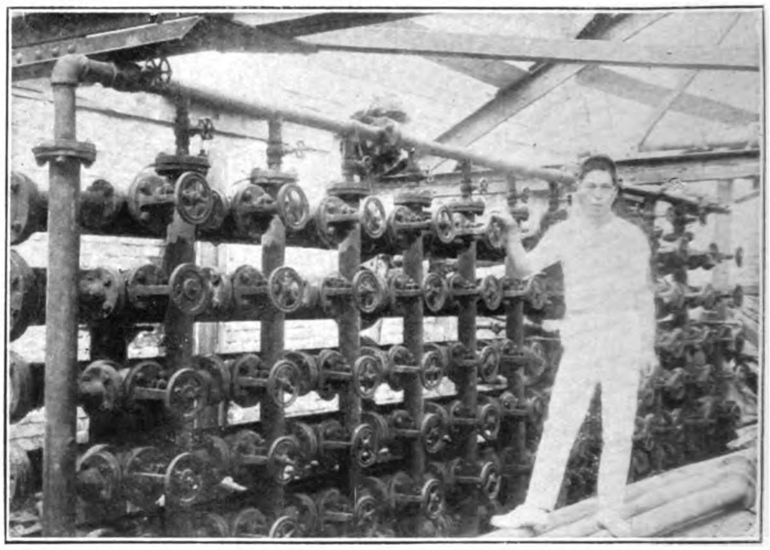


MUKDEN FACTORY OF THE SOUTH MANCHURIA SUGAR CO., LTD.

Diffusion Battery — Carbonization Tanks



Quintuple Effect Evaporator



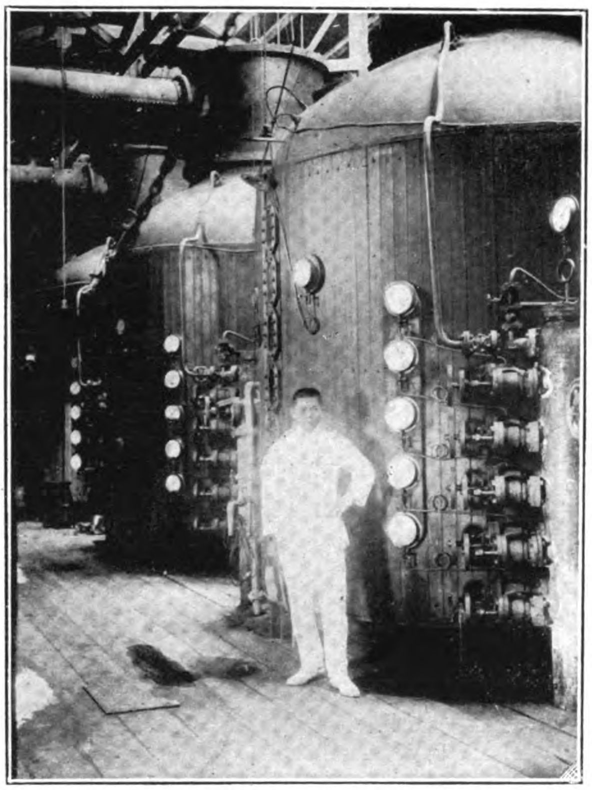
Liquor Pipes and Valves

machinery and the Ashihho factory operating Polish. The Hulan factory has the best equipment and its machines can make 350 tons of beetroot into sugar in twenty-four hours.

The question of disposing of the by-products has been settled by the South Manchuria . Company in the establishment of a distillery, but the beetroot refuse, which might be used as fodder for domestic animals, is thrown away as waste. The Ashihho company sells a small proportion of its surplus syrup to a Harbin distillery, but no use can be found for the remainder. There is also a large accumulation of sugar beet refuse.

In 1922 the South Manchuria Sugar Refining Company established a branch factory at Tiehling. From that time sugar beet cultivation in South Manchuria progressed rapidly.

Climate and soil have an important bearing on the growth of sugar beets. Tables prepared by the South Manchuria Railway Experiment Station show the temperature and the rainfall during the growing period are not ideal in South Manchuria. In summer the temperature is too high and the rainfall too heavy to suit sugar beet planters.



Vacuum Pans

About the middle of autumn, however, there is scarcely any rainfall, there being a period of sunny days and dry weather which makes it a suitable beet climate.

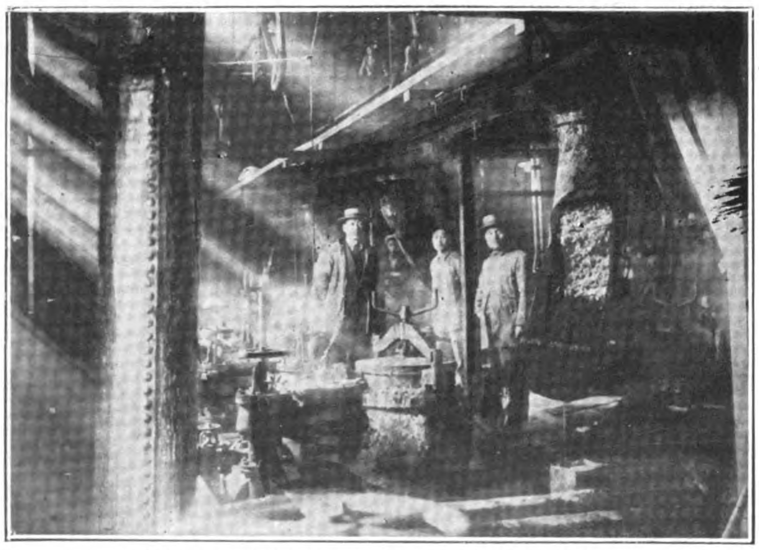
According to Japanese figures, a *mow* of land can produce an average of 78 *kwan* (1 *kwan*=6 catties approximately) of beets containing 15.34 per cent. of sugar. Compared with the beet producing countries of Europe on the basis of one *mow*, the productivity of South Manchuria is surpassed only by Belgium and Germany, as indicated in the following figures, which give the number of *kwan* per *mow*:—

Belgium	Sweden	Austria	Germany
80.26	69.36	64.52	78.96

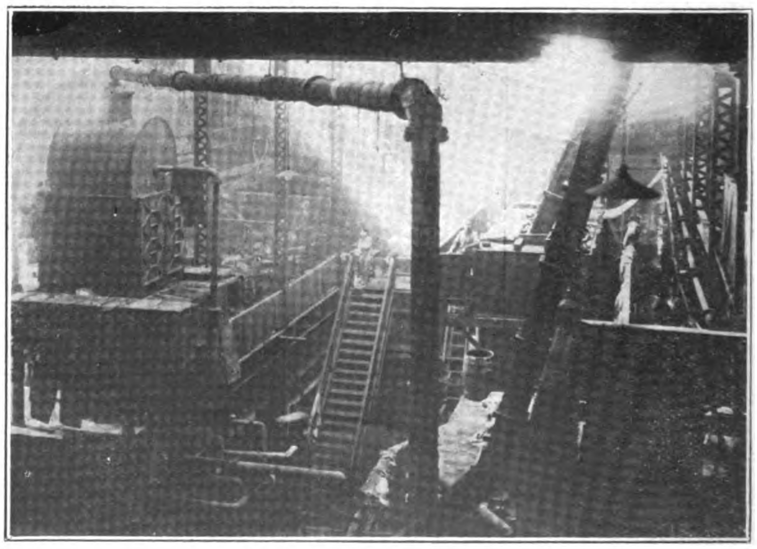
France	Russia	China
66.51	37.96	78.00

Beet Growing is Profitable

The principal agricultural products of Manchuria for a long time have been kaoliang (or millet), walnuts and soya beans. The economic value of beets, however, is greater than that of any of these products. Given the same area of land to each of the four products, the experiment station at Kungchuling in 1916 obtained the following results:—



Charging Diffusion Battery with Beet Chips



Clarification Tanks

	Soya beans	Millet	Walnuts	Sugar beets
Cost of production ..	$40.392	$45.030	$39.090	$81.540
Net profit	0.769	38.392	39.261	64.323
Receipts	41.161	6.638	0.829	17.217

This was not an absolutely fair test since the production of walnuts in 1916 was impaired by the ravages of parasitic insects, while bad weather adversely affected the soya bean crop. In 1917, when the South Manchuria Sugar Refining Company was first started, the result was not successful. They estimated their production for the first year at 10,000 catties (13,300-lbs.), but the actual harvest was only 5 per cent. of that figure. Next year the production was only 2,500 catties as against an estimated 12,000 catties. However, in recent years farmers have introduced many improvements in cultivation methods and have profited much thereby. The number of *mow* harvested in 1923 reached 30,000 (5,000 acres) as compared with 15,000 to 20,000 *mow* in previous years. The following comparison of prices must not be taken as authoritative, owing to the lack of official figures :—

The price paid by the South Manchuria Sugar Refining Company this year for 1,000 catties of sugar beet is said to be $6 in dimes or about Y.4.89, as against Y.6.80 paid by the sugar refining companies in Hokkaido, Japan, for the same amount. The South Manchuria Sugar Refining Company also benefits by cheaper labor, fuel, etc. In Shantung province the period during which seeds are sown falls generally in the season of scanty rain when destruction by injurious insects has a very serious effect on production. Beet cultivation in Korea is confined more or less to the tableland which

Beets Fields near Mukden

is devoted principally to the cultivation of a more important crop, rice. The suga· beet raised in South Manchuria has, therefore, an advantage over that produced in Shantung and Korea in climate and in the position it enjoys as the most profitable crop.

Cheaper Than Cane Sugar

The difference is still greater in the cost of production between local beet sugar and cane sugar imported from Formosa. It takes only $10 to produce an amount of beet sugar in South Manchuria which in Formosa would cost the producer a little over $15. Fifteen catties of sugar can be extracted from 100 catties of beets, while the same quantity of cane yields only 10 catties.

The South Manchuria Sugar Refining Company was established in 1916 and is engaged in the cultivation of beets as well as the manufacture of sugar therefrom. The head office and the refinery are located in Mukden with the sugar beet fields lying in the vicinity. The mill consumes about 500 tons of beet daily and the daily output of refined sugar is about 100 tons. The following table gives the number of *mow* of sugar beet under cultivation by the company, the amount of beets harvested and the annual output :—

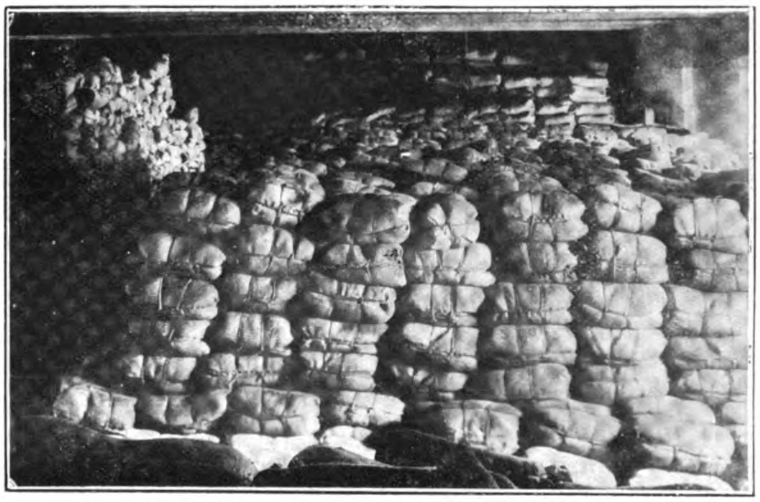
	1917	1918	1919	1920	1922	1923
Number of *mow*	40,000	42,000	20,000	45,000	60,000	30,000
Production of sugar beet .. (in piculs)	100,000	170,000	300,000	450,000		
Production of sugar	20,400	30,000	50,000			

In addition to the beets from its own land or purchased from the farmers, the South Manchuria Sugar Refining Company obtains raw sugar supplies from Formosa, Java, etc. Since the organization of the company the amount of sugar sold was in 1918, 160,000 piculs ; 1919, 140,000 piculs ; 1920, 50,000 piculs. The reason for the limited sale in 1920 was the decreasing demand chiefly caused by the general business slump.

Though for the present, beet sugar is behind imported sugar in quantity and value, the former has the advantage of nearness to the source of the raw material. When the raising of the sugar beet has become a full-fledged industry, it is reasonable to expect an excess of exports over imports.

The facilities for experiment and investigation in North Manchuria are at present limited. Furthermore, the climate is colder than in the South. The industry in North Manchuria had its beginning sometime between the period of development by Russians and the Russo-Japanese war, and is at present confined to two refineries located at Ashihho and Hulan.

According to the reports of the Chinese maritime customs, the amount of sugar imported into South Manchuria from 1911 to 1920 was on the average 500,000 piculs annually. Native production of beet sugar from 1918-1920, on the other hand, was only 33,000 piculs and that in North Manchuria between 1910 and 1915, 36,000 piculs a year. Owing to the small volume of production the data for Hulan is not available. It is, however, estimated at 50,000 poods or 13,650 piculs. The total production of beet sugar by all the companies is estimated at 83,009 piculs, which is only equivalent



Manchurian Beet Sugar Bagged for Market

to one-sixth of the amount imported. Therefore imported sugar still occupies a more important position in the sugar trade of Manchuria. But the geographic and climatic conditions in Manchuria are such that it will be able to compete in the future with sugar that comes from foreign countries.

Ohi Hydro-Electric Plant

(Continued from page 280).

kva ; six synchronous condensers are also provided, each of 15,000 kva.

Although most of the outgoing lines from this station are at 50 kv, there is also an outgoing 11-kv tie line, which takes the shape of a three-core paper-lead cable, steel-tape armored and laid in concrete troughs. This high-voltage cable is one of the few items in the construction work which is entirely the product of the Orient. It was manufactured in a Japanese mill, and is entirely representative of the best cable-makers' practice ; similar three-cored cables to withstand 22 kv are manufactured in the same factory.

The Daido Electric Power Co., by wise consolidation, has grown out of a series of small power companies to an organization of boundless possibilities, because within its territory some 300 miles of main-line railway is operated. All this mileage is fast being converted to electrical operation, and, when completed, a constant and assured load up to 200,000 kw will be available for the power company.

Largest Self-Propelled Floating Crane in the World

The 350-Ton Crane at the Mitsubishi Shipyards in Japan

Built by Cowans, Sheldon & Company, Ltd., Carlisle

AMONG the large floating cranes which have been constructed during recent years, a noteworthy example was that which was built for the United States navy department, on to the hull of an old battleship the Kearsarge, and designed to lift 250 tons at a radius of 101-ft. The hull of the battleship was before its conversion 72-ft. 2½-in. in width, with a total displacement of 11,525 tons. Bulges were added and the width increased to 92-ft., the removal of superstructure and machinery then reducing the displacement to 10,350 tons. Floating cranes of greater capacity have, however, been constructed by Cowans, Sheldon & Co., Limited, of Carlisle, and one of a considerably larger type was recently sent out to Japan. It was designed to lift a working load of 350 tons at 100-ft. radius, or 300 tons at 121-ft. radius. It is of interest to compare the characteristics of this crane with those of a previous crane supplied to the British admiralty in 1915 by the same builders, and with those of the American Kearsarge crane. In making this comparison, it is assumed that the working load of the American crane is given in the American short tons of 2,000-lb. The following are the leading particulars of the three cranes :—

Crane type.	Net load in British tons	Radius in feet.	Lifting moment. foot-tons.
250-ton Kearsarge	.. 223.2	101	22,543
250-ton Cowans, Sheldon	250	100	25,000
350-ton Cowans, Sheldon	350	100	35,000
	300	121	36,300

These figures show that the American crane has a less capacity than had the British crane, which was designed and supplied a number of years before it, and that the 350-ton crane, which forms the subject of the present article, is over 37 per cent. larger as regards its lifting moment. Again, whilst the American crane was built on a battleship hull, which was, of course, very helpful from the point of view of stability, the British crane was—in view of its being designed to meet world-wide competition—placed on as small a pontoon as possible. The accompanying drawing and illustration give some idea of the size of the pontoon in relation to the superstructure. It may be noted that the pontoon is 270-ft. long and 91-ft. wide, with a draught of 10-ft. The comparatively small size of the pontoon confers a greater useful crane radius beyond the ship's side, and it will be seen from the illustration of the completed crane that a load can be lifted over the end of the pontoon as well as at the sides. This feature is very useful when working in narrow and congested waterways, particularly when such operations as the raising of lock gates, etc., have to be undertaken.

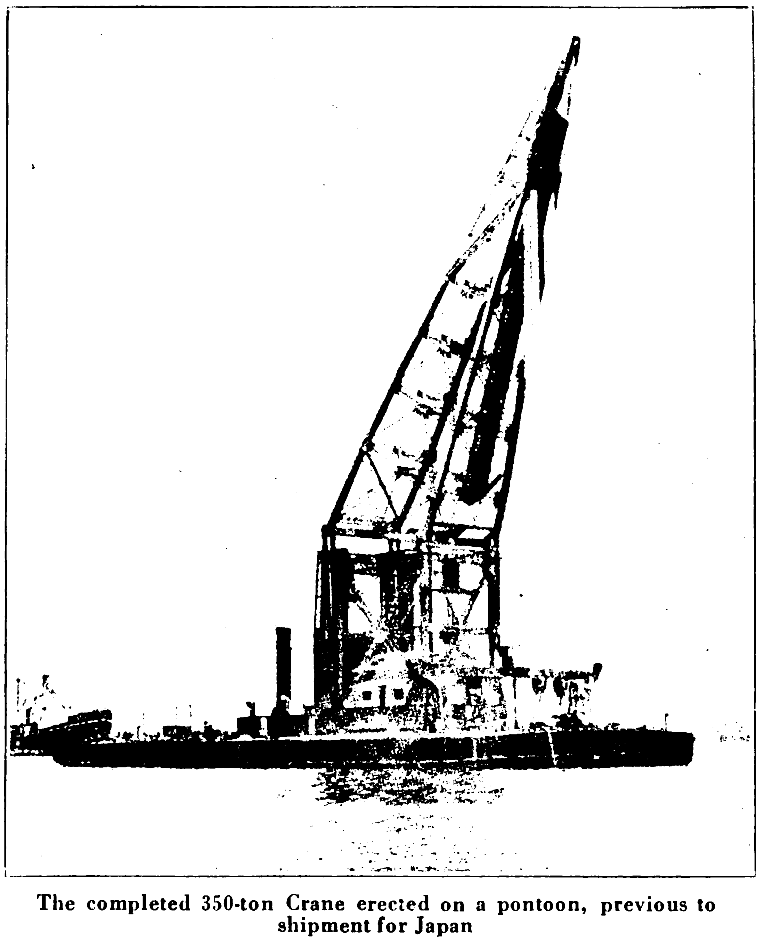
The crane and its machinery was built to the order of Mitsubishi Shoji Kaisha. It was partially erected in the makers' works at Carlisle, and was afterwards re-erected in Japan under supervision of one of the builders' engineers. The pontoon and the propelling machinery were constructed by Mitsubishi Shoji Kaisha, Limited, to drawings prepared for Cowans, Sheldon, Limited, by Sir W. G. Armstrong, Whitworth & Co., Limited. Before giving an account of the interesting work of erecting such a large structure on a floating base, some particulars of the design of the crane and its operating mechanism may be given.

General Particulars

The crane is constructed to lift and revolve through a complete circle with loads up to 350 tons at 100-ft. radius or 300 tons at 121-ft. radius, and is capable of lifting either of those loads through a vertical distance of 140-ft. The main loads are lifted on two independent blocks of 175 tons capacity each, and the operating machinery is so arranged that these blocks may be used either independently or coupled together, as desired. An auxiliary purchase of 50 tons capacity is provided at the end of the jib, at a distance of about 40-ft. in front of the main purchase, and this block is arranged for a vertical lift of 200-ft. There is also an additional purchase of 50 tons capacity carried on a trolley arranged to travel along the underside of the jib to a sufficient extent to move the load through a distance of about 75-ft., measured horizontally. This feature enables the crane to deal with comparatively small loads at a quick speed without the necessity of using the derricking motion.

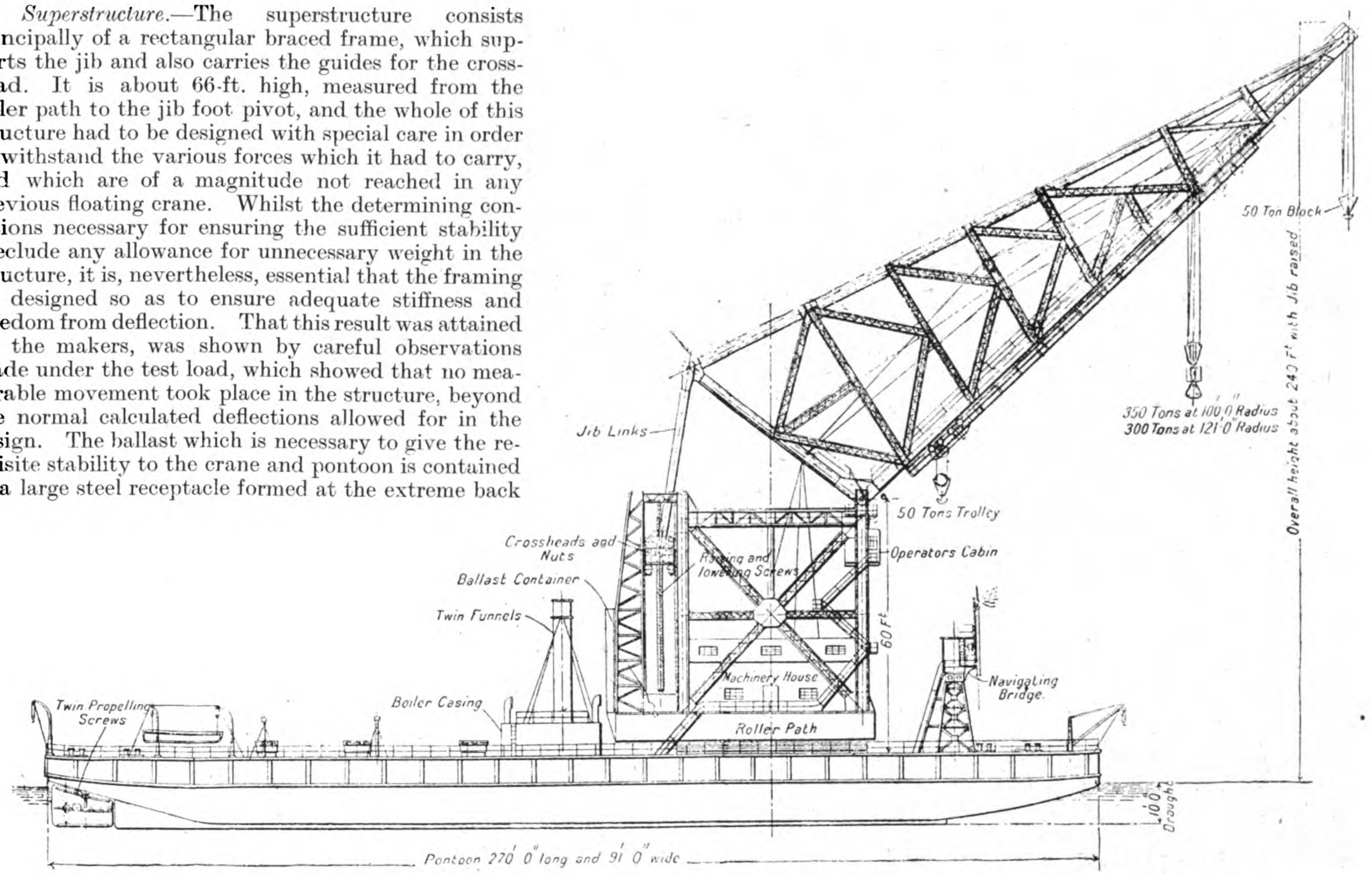
The jib is designed to be capable of derricking in from the maximum radius of 121-ft. to a minimum radius of 50-ft., and when in this condition—as illustrated the overall height to the top of the crane is approximately 240-ft. It will be seen that the entire crane is mounted on a roller path, which has a diameter of about 50-ft., and is furnished with specially arranged machinery, enabling the crane to be revolved with its load through a complete circle in either direction. Each individual motion is operated by an independent set of double cylinder engines fitted with link motion reversing gear, and there are altogether nine such sets of engines on the crane.

The raising and lowering of the jib is effected by means of two large steel screws, 49-ft. long and 14-in. in diameter, situated at the back of the crane, which are driven from the engines through a train of gearing and arranged to engage with nuts housed in the crosshead. The crosshead is 34-ft. wide, and to it the links from the jib are attached. The load on the screws for this crane was exceptionally heavy, and very careful consideration was given by the makers to the provision of adequate bearing surfaces and an efficient system of lubrication. It is interesting to learn that this motion worked with complete satisfaction throughout the extensive trials to which the crane was subjected on its completion.



The completed 350-ton Crane erected on a pontoon, previous to shipment for Japan

Superstructure.—The superstructure consists principally of a rectangular braced frame, which supports the jib and also carries the guides for the crosshead. It is about 66-ft. high, measured from the roller path to the jib foot pivot, and the whole of this structure had to be designed with special care in order to withstand the various forces which it had to carry, and which are of a magnitude not reached in any previous floating crane. Whilst the determining conditions necessary for ensuring the sufficient stability preclude any allowance for unnecessary weight in the structure, it is, nevertheless, essential that the framing be designed so as to ensure adequate stiffness and freedom from deflection. That this result was attained by the makers, was shown by careful observations made under the test load, which showed that no measurable movement took place in the structure, beyond the normal calculated deflections allowed for in the design. The ballast which is necessary to give the requisite stability to the crane and pontoon is contained in a large steel receptacle formed at the extreme back



Arrangement of Cowans, Sheldon 350-ton Floating Crane on pontoon designed by Sir W. G. Armstrong, Whitworth & Co., Ltd.

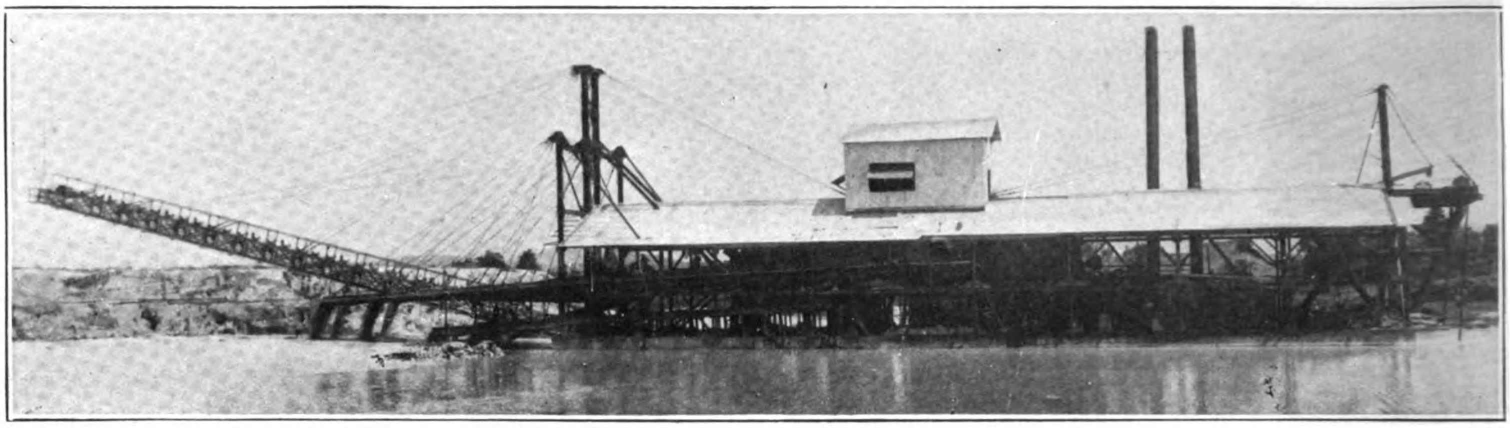
end of the crane and attached to the superstructure. It may be noted also that the pontoon was made of such a size that any moving or water ballast which would have to be adjusted at the discretion of the operator was rendered entirely unnecessary.

Brakes and Controls.—The two main lifting gears and both the auxiliary lifting gears are each provided with specially designed hydraulic brakes to sustain and control the lowering of the loads, and these brakes are strong enough to enable a desired load to be sustained with safety or lowered with precision at any speed between the maximum speed and the lowest possible creeping speed which may be used in practical working. The whole of the motions are controlled by one operator, whose cabin is situated immediately beneath the jib foot, from which a clear view of the load and the site over which the crane is working is obtained. The various motions are operated by a special system of control gear which has been successfully developed by the makers, and which they state enables steam cranes of the type we are describing to be worked with the same ease and precision as that obtained when electric power is used. The steam for operating the different engines is taken from the ship's boilers through a rotary connection at the crane centre, and the exhaust is in each case returned in a similar manner to an independent condenser, which is arranged to work in conjunction with either the crane or propelling machinery.

The Pontoon and Deck Auxiliaries.—The pontoon, illustrated below, is 270-ft. long by 92-ft. wide, and it has a draught of approximately 10-ft. A large area of the deck behind the crane is provided with seating timbers, and otherwise arranged so that it is possible to carry a deck load of about 700 tons. All the propelling machinery is placed amidships, and it consists of twin screw compound engines, which are supplied with steam from two single-ended boilers at a pressure of 150-lb. per square inch. The hull of the vessel was constructed entirely of steel, and it is divided into a series of water-tight compartments by means of transverse and longitudinal bulkheads. The understructure supporting the crane was specially designed to carry the enormous revolving load with practically no deflection, a feature which is essential in order to ensure accurate bearing on the roller path in all positions. In connection with this, it may be remarked that the entire roller pathway was accurately machined by a special machine tool which the makers have constructed for this purpose, and which has given highly satisfactory results on this and other large cranes which the firm has made. The deck equipment comprises a steam windlass with warping ends, four steam capstans, and complete steam and hand steering gear, together with the usual complement of skylights, scuttles, bollards, fairleads, davits, lifeboats, and all other auxiliaries necessary for a sea-going vessel. As will be seen from the accompanying drawing, the navigation of the ship is controlled from a steel bridge extending the full width of the deck, which is situated immediately in front of the crane base. Double timber fenders, fitted with vertical rubbing pieces and placed at the sides and ends, protect the hull in the usual way.

Erection and Testing

As may be well imagined, the enormous size of the structure and the weight of various finished parts was such as to demand a very carefully planned scheme of erection. The difficulties and dangers were enhanced by the fact that assembly had to take place on a floating base, which from time to time had to be careened to a sufficient angle to enable parts to be joined together. We have already mentioned that the main parts of the crane were assembled at Carlisle, and were shipped in pieces of appropriate size for erection. The work on site was facilitated by the service of another floating crane, which had previously been supplied by the same makers. There were six typical stages in the work of erecting the jib, which weighed over 300 tons. The first operation was to lift the lower section from the quayside and place it in position for securing to the superstructure. This operation, was completed in the short space of six hours. Then followed the lifting of the top section, which proved a delicate and difficult task, especially in the final stages just before it was attached to the lower section. This work occupied only four hours, which bears testimony to the extreme accuracy with which the various component parts were manufactured and prepared for placing together. After its completion, the crane was subjected to an extensive series of trials, and that everything was shown to be in full accordance with the specified requirements, and that the trials were carried out to the entire satisfaction of all concerned.—*The Engineer.*



Type of Modern Tin Dredge at Work near Ipoh, F.M.S.

Tin Dredging in Malaya

Paper Read by A. J. Kelman Before the Engineering Association of Malaya

BEFORE dealing with the main subject of my paper, I shall try to describe to you a little of the history of bucket dredging for the recovery of minerals. As you are all aware dredging for gold was first started in New Zealand, the first dredge starting in the year 1865, on the Clutha River. This early type of dredge was what is known as a Spoon Dredge, the digging apparatus consisting of a piece of iron bent in the shape of a horseshoe, and attached to which was a bullock hide, this was dropped in the bed of the river and dragged along by means of a hand winch ; the material scooped into the hide was than hauled on board and washed in a small sluice box.

After the Spoon Dredge came the steam driven dredge, the first of which kind was built in the year 1882, but afterwards was converted to what was called a current wheel dredge. Attached to the pontoon of this dredge and driven by the current of the river were two side paddle wheels to which were fastened sheet iron buckets which lifted the water for washing the material ; from these wheels power was transmitted to drive the buckets. The great disadvantage of this type of dredge was, that to gain sufficient power to drive the buckets it was necessary to keep out in the current of the river, it being impossible to work in near the banks.

As years went on and with the addition of later improvements steam dredges were built, gradually increasing in size until (I think I am right in saying that the largest dredge built in New Zealand was about 7 cubic feet bucket of the open connected type).

The American Dredge

Recently an American dredge of a much heavier type and having a larger capacity has been installed on the west coast of New Zealand, where it is proving very successful in its operation.

In my opinion a great factor in bringing dredges up to the present state of efficiency has been the progress made by the American dredge builders, who have succeeded in bringing to the dredging industry an entirely different type of dredge from that which has been operating in New Zealand.

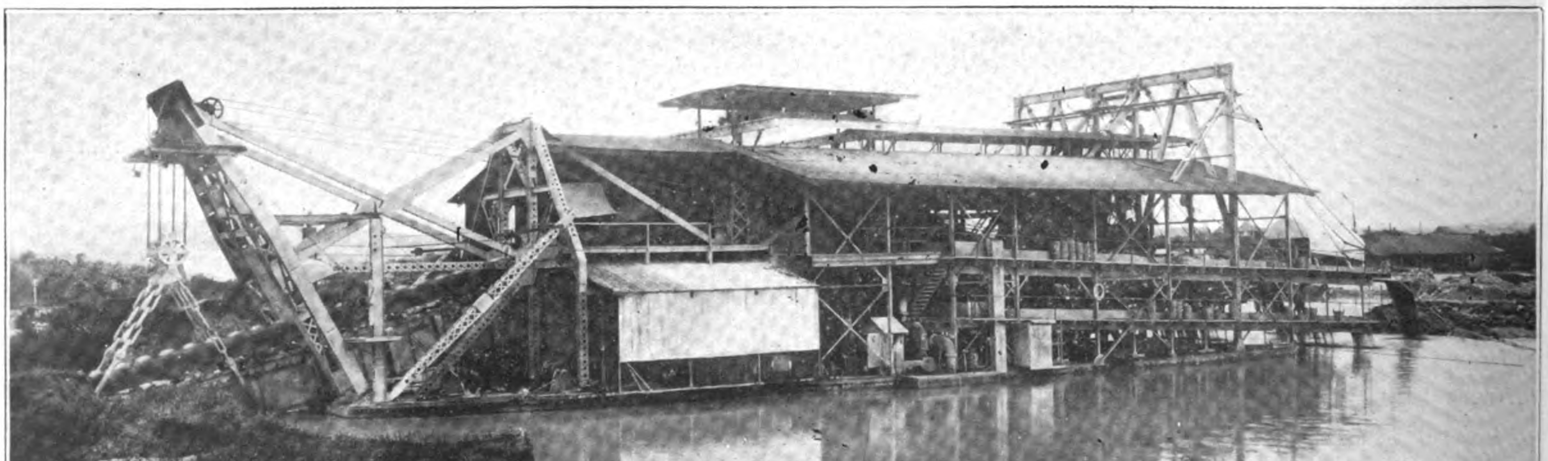
The American dredge is usually electrically driven and of the close connected type, the buckets made either of manganese or nickel chrome steel, with nickel chrome pins. They are also equipped with a spud as it has been found that the size of head line required to hold these dredges up to the face when working heavy gold bearing wash, being too cumbersome to handle.

The spud is a long steel casing with a heavy steel point ; this is supported at the stern of the dredge and lowered to the bottom, and when the dredge is working, pivots on this point.

The length and size of these spuds depends on the depth of the ground to be worked and the size of the dredge.

The aim of the American designer has been to produce a dredge with increasingly large capacities as it is found that, as the richer areas have been worked out, it is necessary to increase the capacity of their dredges to enable them to successfully treat the lower grade areas, and a good many of their machines have very much larger capacities than anything we have in this country.

Having thus briefly dealt with gold dredging in New Zea-



American Built Tin Dredge on the Tronoh Properties of the Gold Mining Company

land and America, we will now consider the question of dredging for tin in this country.

As you are aware mining for tin in the Federated Malay States is a very old industry, tin having been mined by the Chinese for approximately 200 years.

Australian Built Dredge on the Properties of the Sixth Taiping Tin Dredging Co., Ltd.

The First Dredge in the F. M. S.

The first dredge to work for tin in the F.M.S. was a small machine which started working at Tronoh in November 1912; this machine was built principally to work tailings, but did not prove a success. The Malayan Tin No. 1 which started working in January 1913, was the first machine to work successfully in this country.

This dredge originally had a 12-in. gravel pump to enable the ground to be dug from between the uneven limestone pinnacles but the pump was eventually discarded.

It was soon found that this dredge had not sufficient table area, it was also found that the stacker was not needed in this class of ground, and by discarding the stacker the dredge had sufficient flotation to enable extra tables to be installed. On our other dredges provision was made for extra tables and I think I am right in saying that the area of the tables on our dredges is greater than on most dredges in this country, but it is found that we still have insufficient for this class of ground, but to increase the table area, it would be necessary to increase the size of the pontoon in order to give sufficient flotation for the extra weight the dredge would then have to carry.

The size of a dredge is usually governed by the nature of the material to be dug and the depth to bedrock. With ground composed of cemented material buckets of the largest size should not be used, but where large boulders are encountered the larger buckets are better for ease in handling.

When shallow ground is to be worked there is the difficulty of floating a larger dredge as they usually draw from 10 to 12 feet of water.

In designing a dredge for any particular area the nature of the ground should be very carefully studied and the machine designed to suit that particular class of ground as a dredge suitable for one area may not be suitable for another, where there is a different class of ground to be treated.

The difference between tin and gold dredging is principally in the saving, tin being much lighter than gold and being much more difficult to save.

The method we have at present in use, viz., the concentrating of the tin in launders gives a loss from 10 to 15 per cent. and in this method there is considerable room for improvement.

Mr. Newsom's Experiments

Mr. Newsom, of the Yukon Gold Company, has been experimenting with a combination of classifiers and jigs and has perfected a concentrating system which in my opinion is a great improvement on the present method. I am of the opinion that before long we shall see most of the dredges equipped with this type of concentrator.

Mr. Newsom claims that the loss in concentrating by his system is round about 2 per cent. as against our present loss of from 10 to 15 per cent. Not only does this system increase our saving but it would make our present dredges capable of treating the maximum amount of material they can dig.

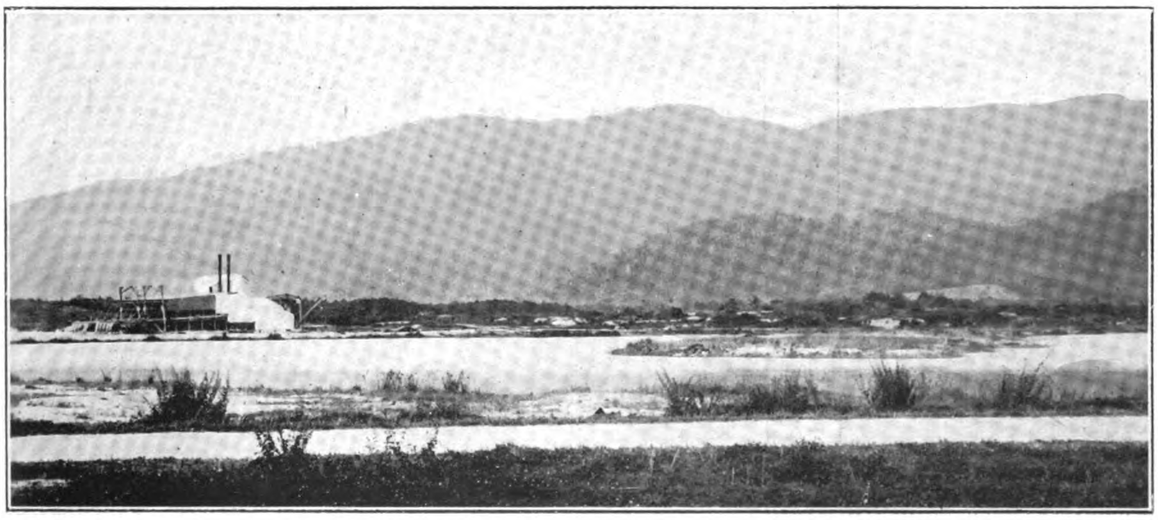
Most of the dredges in this country are capable of digging considerably more than what the tables can handle and I estimate that with the installation of this type of classifiers and jigs, a number of these machines would be able to increase their yardages by approximately 25 per cent.; the cost of running the dredge to treat the increased yardage being very little more than our present cost.

On some of the dredges already working it would be impossible to fit on this appliance without redesigning the whole of the superstructure.

There are difficulties in dredging for tin in this country, which is not usually found in gold dredging areas, that is desintegrating the tin bearing clays found in some areas and the method we have in use namely the revolving screen is not very efficient. In some cases high speed puddlers have been installed with a certain amount of success, but I consider there is still room for improvement in this respect. Another difficulty is the limestone bottom, and a number of dredges in this country are working on areas with this class of bedrock. In working on these areas a certain amount of material must be left behind depending on the irregularity of the limestone.

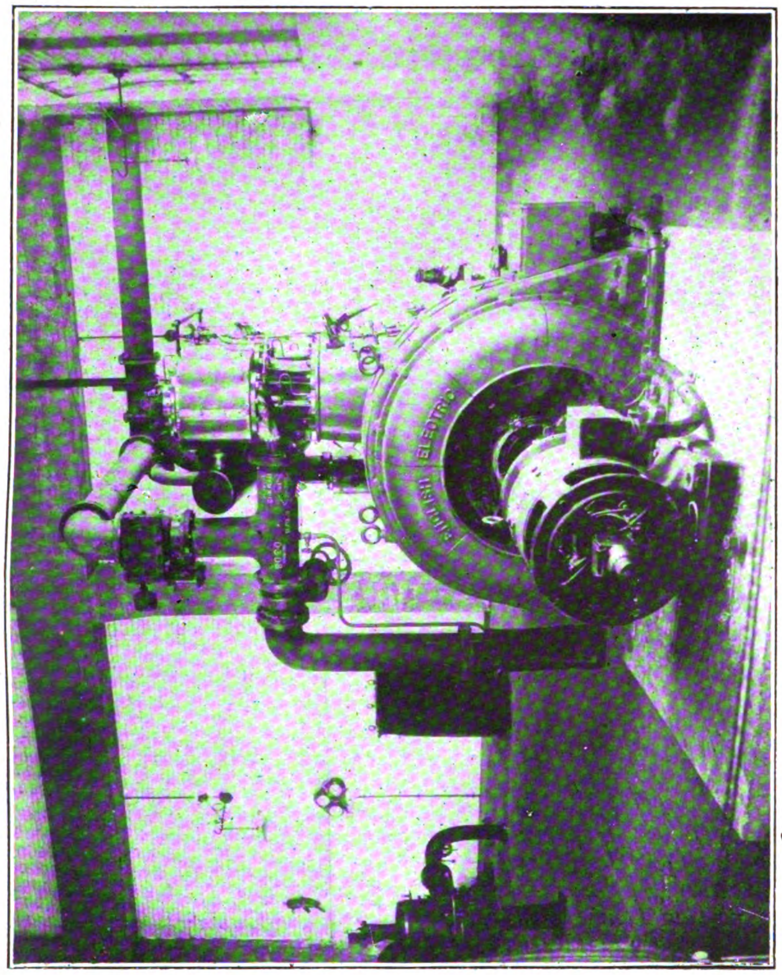
In estimating the amount of material that can be dug by a bucket dredge this must be taken into account and an allowance made accordingly.

Working on this kind of bedrock also tends to decrease the yardage treated, as the winchman must be very careful when working between the pinnacles, and is not able to keep full buckets the whole time. Sunken timber is another difficulty we come up against in the swampy areas, and one which causes a good deal of lost time, seriously affecting the monthly yardages in some case.

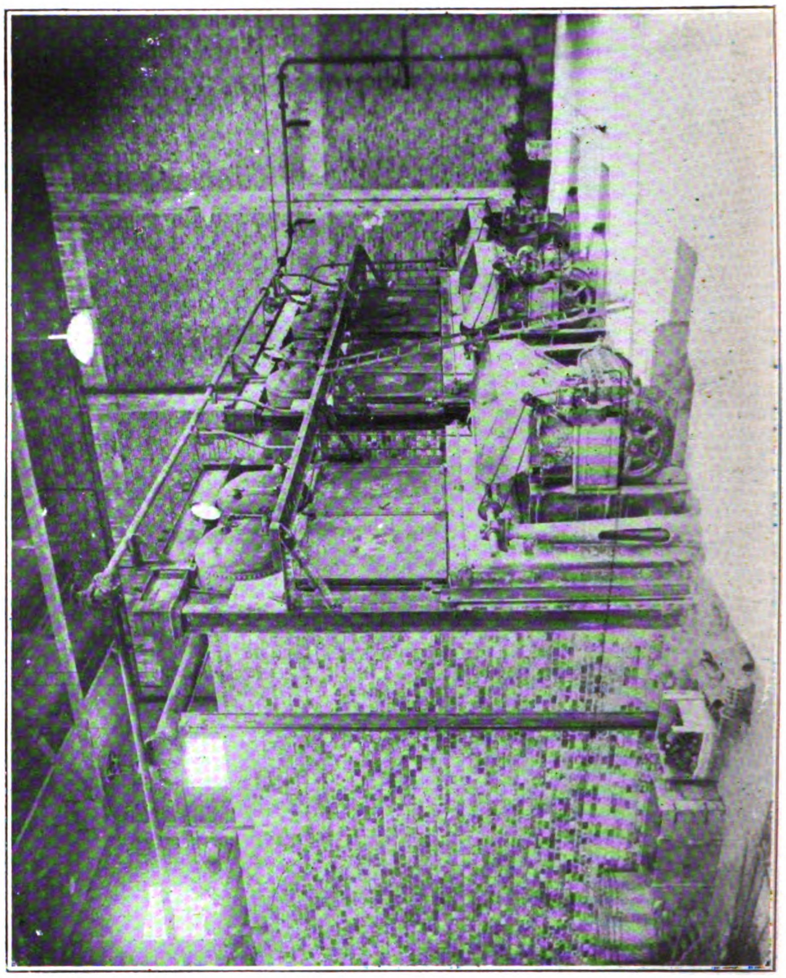


Bucket Dredge at Taiping

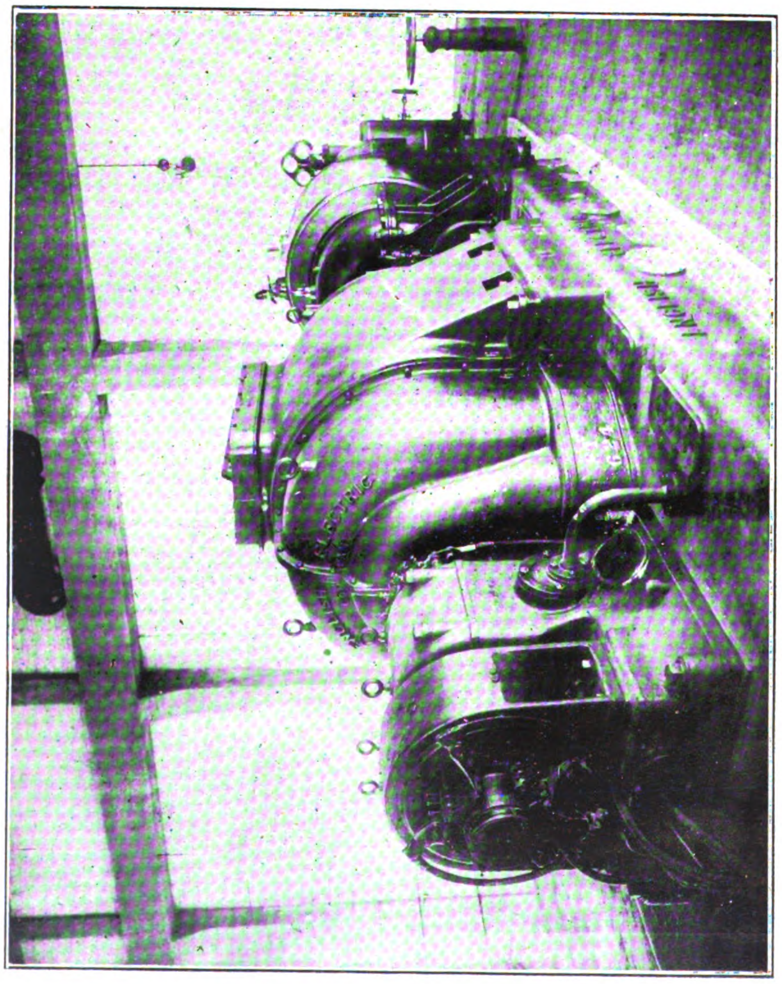
AN ENGLISH ELECTRIC TURBO-GENERATING PLANT FOR THE TIENTSIN-PUKOW RAILWAY INSTALLED BY THE JARDINE ENGINEERING CORPORATION



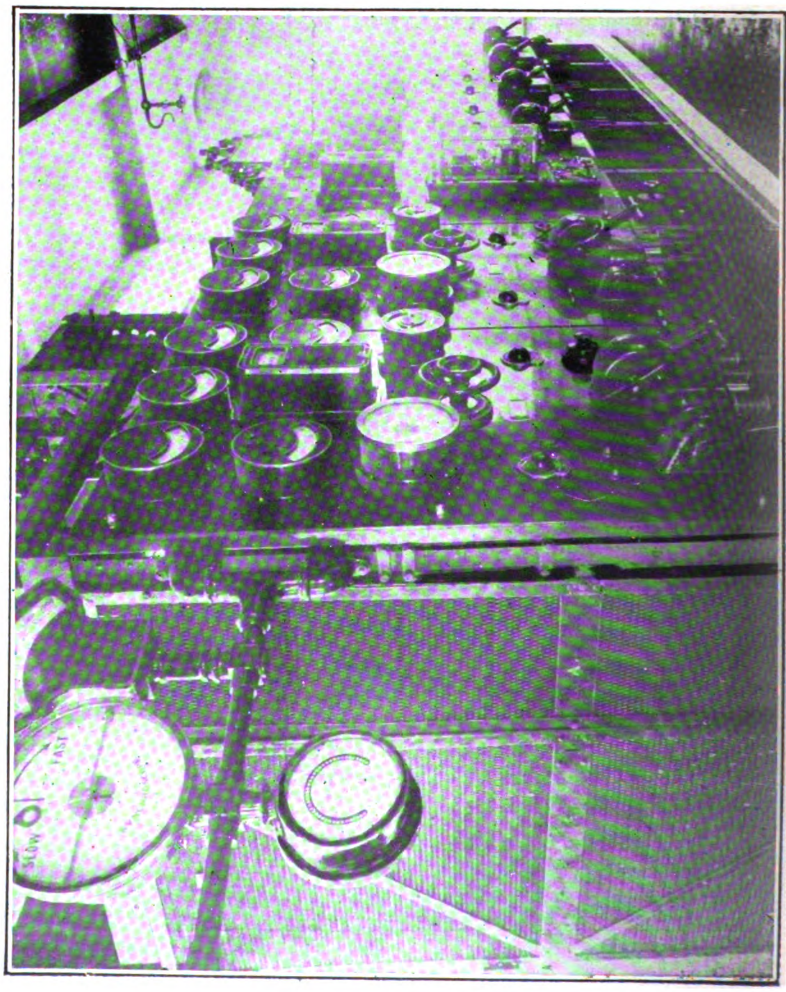
200 K.W. Engine Alternator Set for Carrying the Lighting Load



Boiler Plant—Babcock & Wilcox Watertube Boilers with Superheaters, Chain Grate Stokers, etc.



1000 K.W. Turbo Alternator Set Installed in the Pukow Powerhouse



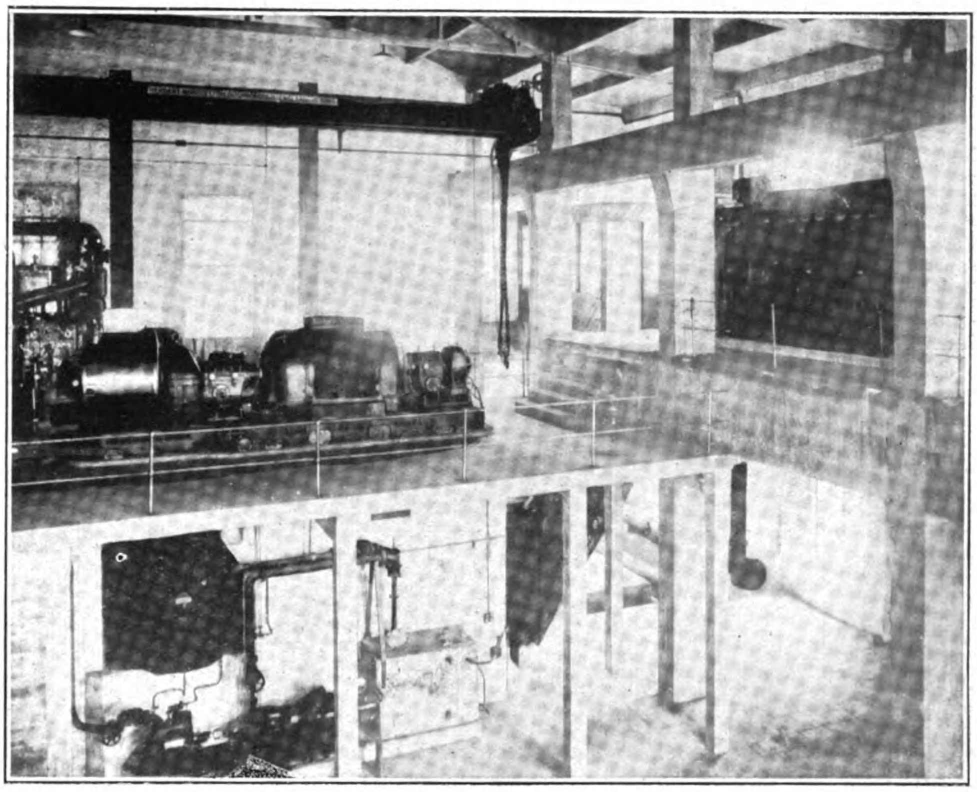
View of High-tension (6,600 volt) Switchboard in the Railway Powerhouse at Pukow

The Tientsin-Pukow Railway

Lighting and Power Scheme

OUR illustrations show the plant installed at Pukow for the lighting and power requirements of the Tientsin-Pukow Railway at Pukow and Puchen. This plant formed part of an ambitious scheme of expansion and development which commenced three or four years ago, embracing the purchase of the well-known "Blue Express;" the purchase of several new locomotives and a large amount of rolling stock; the building and equipping of two large and modern repair shops at the railway's works at Puchen; and the inauguration of a waterworks at Pukow. All these projects have been carried out, and in two or three weeks the lighting and power plant also will be officially placed in commission.

The plant is designed to supply power for lighting the railway wharves, godowns, offices, station, and station approaches at Pukow, as well as to supply power for the workshops at Puchen and for the residences, yards and offices in the vicinity of the workshops. The plant comprises one 1,000 k.w. turbo alternator plant and one 200 k.w. steam engine alternator set, the former to carry the day load provided by the power requirements of the workshops, and the latter the lighting load which comes on at night time.



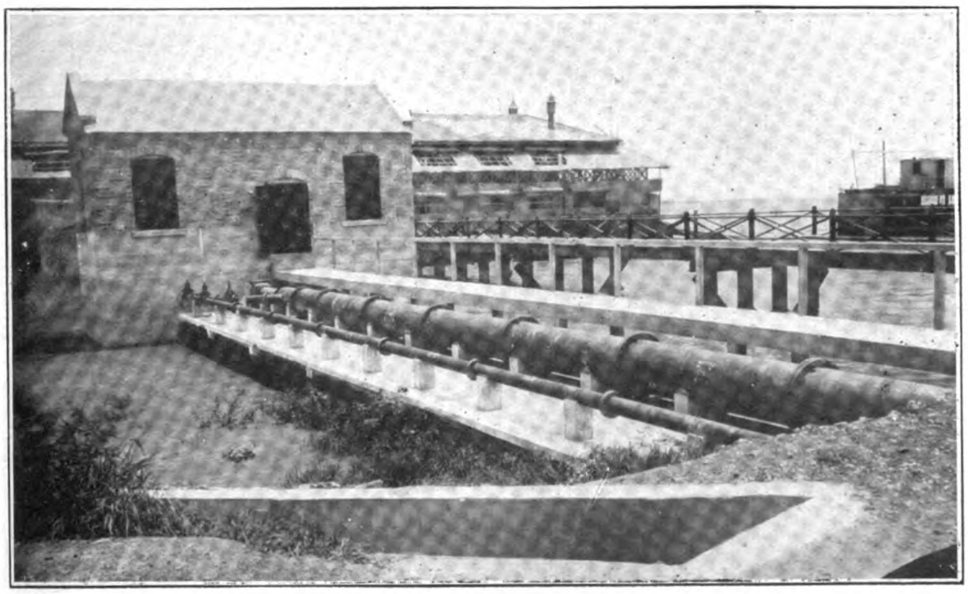
GENERAL VIEW OF ENGINE ROOM
1000-k.w. Turbo and Condensing Plant. Switchboard on Right

The boiler plant comprises three Babcock & Wilcox watertube boilers each of 2,852 sq. ft. heating surface, with superheaters, mechanical chain grate stokers, economiser, motor-driven Sirocco induced draught fan, and Weirs feed pumps. The boilers are designed for a working pressure of 200-lbs. per sq. in., with 200° F. of superheat. A feed water heater has been installed using the exhaust steam from the feed pumps and stoker engine.

Power is generated at 6,600 volts 3 phase 50 cycles and transmitted to Puchen at the same pressure by means of two 625 k.v.a. overhead feeders. The high-tension lines are carried underground for a quarter of a mile at each end to prevent obstruction and at the same time protect the plant from lightning.

At Puchen the power is stepped down to 550 volts for distribution to the motors in the workshops, and to 380 volts for lighting, a three-phase four-wire system being adopted. There are two power transformers of the standard oil immersed type, each of 625 k.v.a. capacity 6,600/550 volts; and one lighting transformer of 50 k.v.a. capacity, 6,600/380/220 volts.

The lighting at Pukow is provided for by one 100 k.v.a. transformer, 6,600/380/220 volts, placed in the power station, from whence the low-tension 3-phase 4-wire distributors are taken. A 125 k.v.a. transformer, also located in the power house, provides power for the station accessories.



PUMPHOUSE FOR CIRCULATING WATER
Located on River Bank—Vertical Spindle Pumps are used owing to large rise and fall of the water

The main switchboard in the station is of the remote mechanically controlled type, the high-tension gear being enclosed in steel cubicles behind the control panel. The switchgear in the Puchen substation is of the ironclad truck type. The high-tension system is ungrounded.

The entire contract including the supply and erection of the power plant, substation gear, transmission lines, distributors, and wiring of godowns, wharves, houses, etc., has been executed by the Jardine Engineering Corporation, Ltd. The turbo plant, steam engine-generator set, transformers, switchgear, and motors were manufactured by the English Electric Co., Ltd., and the boiler plant by Messrs. Babcock & Wilcox, Ltd.

We are indebted to the Tientsin-Pukow Railway Administration for permission to publish this article, and to the Jardine Engineering Corporation, Ltd. for the photographs and several of the technical details described.

View of Pristan District, Harbin

View of Kitaiskaya Street, Harbin

Harbin's Waterworks and Sewerage Project

From a Report of the Technical Committee to the City Council

BASIC conditions under which Harbin's city council proposes to grant a concession for waterworks and sewerage systems have been elaborated by the building and technical committee after some months intensive study of the various problems involved. The water will be taken from the Sungari River, analyses of which have shown the stream to be free from nitrates and ammonia, and to carry only a trace of chlorine. Comparison of these analyses with the water of the Dnieper and the Volga show the Sungari to afford a water of high purity. It is especially free from disease carrying bacteria and has only 60 to 600 micro-organism to the cubic centimeter as against some 12,000 in the water of the Volga. Even with this satisfactory showing, it is planned to instal filterbeds which are expected to reduce the bacterial count to but one per cent. of the present low average.

The flow of the Sungari varies markedly, but at Harbin it is 113 cubic sagen a second on an average, the sagen being seven feet, this flow works out at some 39,000 cubic feet. Wells as a source of supply also were considered but the high cost of drilling and the chance that some might come in dry, has left this matter in abeyance. The population to be served by the waterworks is about 56,000 since the first installation will be limited to the Pristan and Newtown districts, but the works will be designed to accommodate almost twice as many people, thus giving a comfortable margin for growth and extra use of water.

Studies of other Russian inhabited cities have been made to determine the daily water consumption which ranges from 12.25 vodro (one vodro equals 3.25 gallons) to less than one vodro, but the average has been taken as four vodro, about 15 gallons per capita, per diem. This is considered a liberal estimate for Harbin where there are many private wells and some small pumping systems. The works capacity, therefore, has been fixed at 400,000 vodro which is expected to leave a safe margin for fire-fighting and street sprinkling.

Householders payments will be made by meter, while no charge will be made for water used in fire-fighting. House connections are at the expense of the tenants and material will be charged against them at rates to be fixed by the city. While no particular kind or make of pumping plant has been designated, the concessionaire will be compelled to put in machinery of the latest and most approved construction. The filters are to be of the American pattern and are to be designed to eliminate 99 per cent. of the bacteria in the water as it enters the beds. Reservoirs will be installed to make a safe

Mostowaya Street

Another View of Kitaiskaya Street

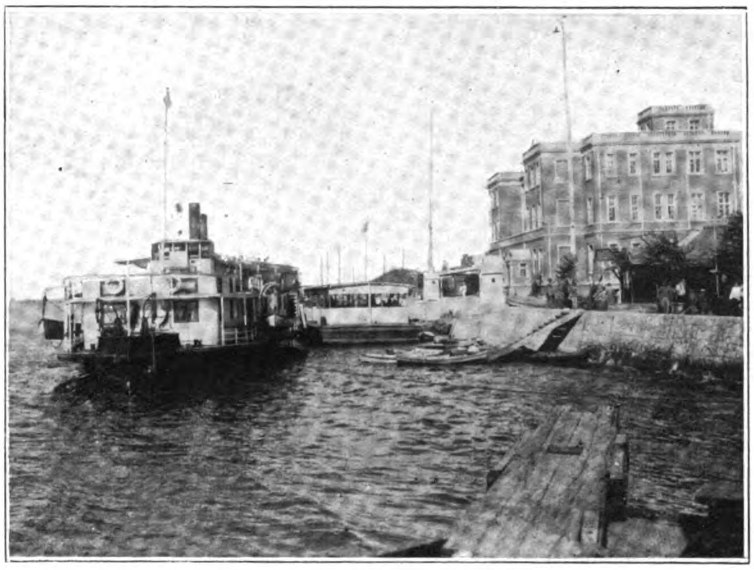
margin in case of sudden demand due to a breakdown in the machinery or an extraordinary fire.

The mains are specified to stand a pressure of not less than 15 atmospheres or 220 pounds to the square inch, and the pressure on the whole system must be at least equal to a delivery head of 85 feet. Fire hydrants are to take a two-inch hose and stand a pressure of 90 pounds. Some 80 hydrants will be installed from 500 to 700 feet apart.

The question of drainage and sewerage systems was gone into thoroughly and from topographical considerations, it was decided to have two separate systems, one from the Pristan district into Machiako creek and the other, which also will serve Pristan in part, into the Sungari below the city. This dual plan takes into account, and uses the existing drainage system. Sewage to be handled is estimated at 1,200,000 gallons daily. Pipes for this system must be of iron or concrete, wood being barred.

General Provisions

The term of the concession desired must be stated in the bid and will have a bearing on the award as the city plans to take over the system itself after the expiration of the contract or even before under certain conditions. The successful bidder must put up $300,000 silver or bank guaranteed of that amount. Interest on such deposit will be paid to the depositor. If work is not completed as provided or is stopped entirely in non-fulfilment of the contract, the deposit shall be forfeited to the city which also may sue for damages.



The Sungari River at Harbin

At the demand of the city, the present contract may be cancelled: If the concessionaire has not by the end of the third year completed the work of the first category; if the concessionaire does not on time complete work according to contract of the second category; if the work of the constructed waterworks and canalization, or either of them, in whole or in part, does not function properly for more than one month, and if the bargain money is not deposited properly.

The city has the right to control the fulfillment of this contract, during the period of construction as well as during the term of duration of the concession. The city shall have the right to purchase the construction of the concessionaire prior to the period of expiration of the contract term.

During the first period, *i.e.*, within three years of building period, the concessionaire should lay not less than 25 versts of water and 25 versts of sewage pipes with all equipment relating thereto for the correct and proper functioning of the system of waterworks and sewerage. Of these nearly 15 versts of both kinds of pipe are located on the Pristan, and approximately 10 versts of pipe of both kinds are in Newtown.

Within the above 25 versts are not included feed pipes from the waterworks pumping stations, the main collector to Machiako creek, branch collectors to transfer points or other pipes not shown in the plan but necessary for the proper functioning of the systems. During the same period the concessionaire should also construct all necessary installation for removing storm overflow from the Pristan.

The construction of a waterworks and system of sewerage along streets not included in the 25 versts of the first period should be completed by the concessionaire in equal parts within 10 years from the date of completion of the construction period.

The districts where such extension work is to be performed will each time be agreed upon between the city and the concessionaire.

In conclusion the city has in mind the installation of a modern system of waterworks and sewerage by granting a concession, giving the concessionaire the exclusive right to construct and exploit such a system within city limits, as well as the right to occupy the necessary lands. At the expiration of the period of the concession, the concessionaire must turn over to the city, in perfect working order and free of charge, the entire installation, give the city the right to purchase the installation before the expiration of the concession period, and to furnish water free of charge for purposes of fighting fire.

Phones *versus* Bandits

Prefect Chao of Changchun has taken in hand the execution of his plan to construct telephone lines in his prefecture at an estimated cost of $40,000. It is to provide against possible bandit raids. He has contracted for the purchase of 4,700 telephone poles, 8,000 insulators, and other accessories. When the new telephone system gets into working order, the bandit operations are expected to be quickly ended.

Granted Shale Oil Deposits

A concession is reported to have been obtained by the South Manchuria Railway from the Chinese government for the exploitation of the shale oil fields which the firm recently discovered in Fushun. Mr. Takejiro Kawamura, president of the company, recently made a visit to Peking and held conferences with officials of the Chinese government in connection with the oil lease.

The company plans to produce 50,000 tons of oil this year at the estimated cost of Y.5,000,000, the necessary plants and equipment to be erected as soon as possible, according to Mr. Kawamura who returned to Dairen from Peking recently. He said that if results are satisfactory, the enterprise will be launched on a five-year program which will cost in the neighborhood of $50,000,000, and that it will then no longer be necessary to import oil from America.

Mr. Kawamura has left Dairen for Tokyo to make the necessary arrangements with the central government for the proposed enterprise.

New Sugar Refinery

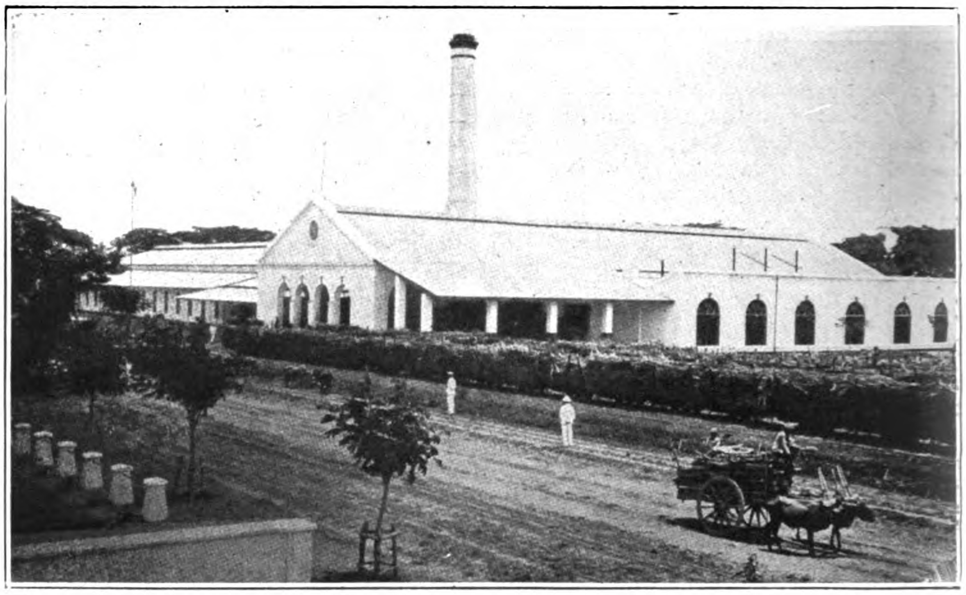
Announcement has been made that the Honolulu Iron Works has received a contract for the construction of a sugar refinery at Tokyo, for the Dai Nippon Sugar Manufacturing Co. The contract calls for a payment of $990,000 to the Iron Works for the job. Although the Iron Works has constructed most of the mills in Formosa, whose sugar is controlled by Japanese interests, the contract for the refinery in Japan is the first ever received by the local company from that country. A good part of the machinery for the refinery is to be built in Honolulu. Upon the arrival of J. T. Taddiken, engineer in charge of sugar refinery and beet sugar machinery, the work for the Tokyo refinery will be allocated.

Under the contracts now made the Iron Works has obtained work which will keep it fully employed for at least a year. Only a short time ago the Iron Works received $2,000,000 contract from Central Vertienties of Cuba. Two other contracts covering work in the Philippines are a $750,000 job for Central Bacolod, and a $50,000 job for Central Garcia.

Java's Sugar Struggles During Twenty-Five Years

THE jubilee number of *De Indische Mercuur*, covering a period of 25 years of successful trade journalism of the noted Holland journal published in Amsterdam, has just reached our editorial tables. The special edition is mechanically well gotten up, is handsomely illustrated and epitomizes the progress of the colonial interests of the kingdom commonly called Netherland East India to which sturdy Dutch have devoted much energy and outstanding initiative. An exceptional array of facts and figures with keen analyses of various industrial and agricultural interests, by experts who know their respective fields, are recorded in the edition. Rubber, tea, petroleum, tobacco, sugar, forests, marine matters, finance, international relationships, all are magnified and correlated to serve the large enterprises of the colonies.

Dr. H. C. Prinsen Geerligs, the distinguished authority on world sugar matters, who stands as the premier promoter and prophet of Holland sugar interests, writes the story of Java's struggles which have resulted in giving her such world leadership in the vast enterprise in which she is engaged. A free translation of the story is appended.



Typical sugar factory in Java

The development of the sugar industry in Java during the last 25 years will be easily visualized by perusing the tables of factories at work, areas planted, annual production and averages deducted.

Year		Factories at work	Area in bouws	Total Sugar L tons
1898	.. ..	188	113,625	725,030
1899	.. ..	183	118,367	762,447
1900	.. ..	182	128,301	744,257
1901	.. ..	182	144,088	803,735
1902	.. ..	183	147,018	897,130
1903	.. ..	178	143,616	944,798
1904	.. ..	176	146,078	1,055,043
1905	.. ..	173	149,033	1,039,178
1906	.. ..	176	156,714	1,067,798
1907	.. ..	178	162,452	1,210,167
1908	.. ..	178	165,686	1,241,855

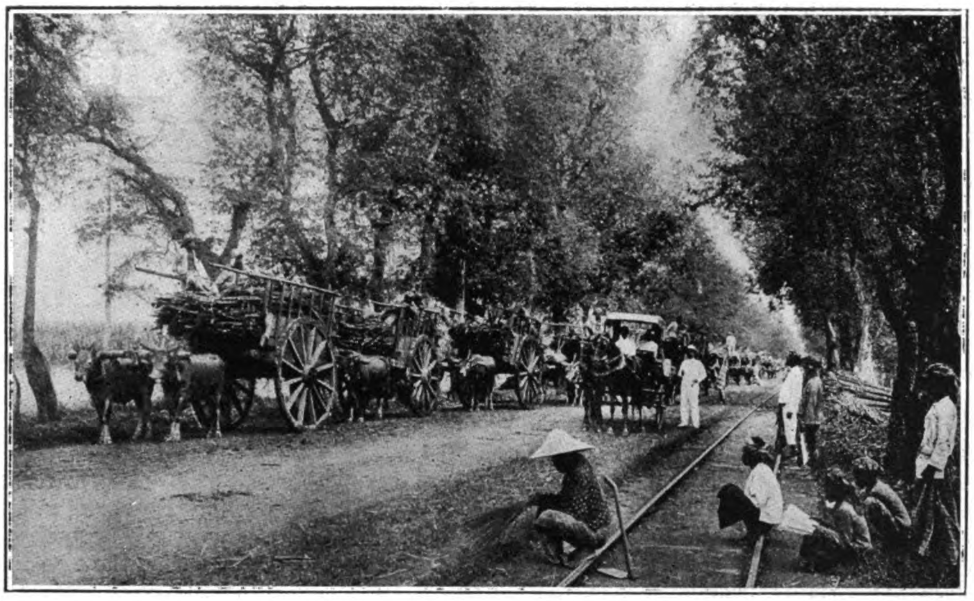
Year		Factories at work	Area in bouws	Total Sugar L tons
1909	.. ..	182	172,077	1,241,726
1910	.. ..	182	178,292	1,280,300
1911	.. ..	185	191,335	1,466,459
1912	.. ..	184	197,707	1,406,399
1913	.. ..	190	204,788	1,465,975
1914	.. ..	186	207,800	1,404,942
1915	.. ..	186	213,013	1,319,087
1916	.. ..	186	221,823	1,629,827
1917	.. ..	185	226,082	1,822,118
1918	.. ..	186	229,791	1,778,207
1919	.. ..	179	193,977	1,336,112
1920	.. ..	183	219,925	1,543,923
1921	.. ..	183	224,724	1,685,334
1922	.. ..	182	226,760	1,808,036

Preparing the land for sugar-cane planting

From the table it is apparent that the number of sugar factories remained practically the same in 25 years, around 180. But the cane area increased, especially between the years 1900 and 1913, since then, however, it has remained about the same.

At the beginning of the period under consideration the sugar situation in the world was not very hilarious and in Java not at all favorable. This time marks the era of the tariff wars which began in 1884 and which resulted in the doubling of the export premiums in Germany in 1895, taking on a malignant form to strangle real industrial incentives.

Thus premiums offered for exports obtained by levying surtaxes gave the beet sugar manufacturers strong protection and they could freely flood the markets of Great Britain, the United States and British India thereby offering sugars very cheap and depressing the prices on the world sugar market. Java sugar had no such unnatural bolstering by the government's offering a premium and therefore was not in a position to make any conquests in the free markets. Yet this was the time when modern scientific research was beginning to blossom forth in fields and factories. Splendid advances were made in the



Cane transport near the factory

study of soils and plant diseases and insects and carried with fertilizers and special researches were made in them a large increase in the area planted to cane. In the factories also the work was pursued assiduously where technical and mechanical improvements were made and the owners of factories had no fears of investing in large sums to improve not only the machinery but their transportation facilities making real endeavors to raise the sugar tonnage and therefore lowering the cost of manufacture.

What was exceedingly disheartening was that all this extra effort was battered down by the European beet sugar manufacturers by the regulations they made continually lowering the market prices so that the manufacturers in Java never could see ahead to know whether they had a chance to exist.

This menace brought about long negotiations which precipitated a great move on the part of Great Britain against the rigidity of a system of premium fed sugars enforced by kartels. Out of this agitation the Brussels convention arose, with which the Netherlands government began to co-operate at once. Beginning with September 1, 1903 the conclave began to operate, various great powers having banded themselves together to place sugar on a basis minus premiums or artificial aid so that foreign and home sugars were not shunted below certain levels in price. Sugar was igven the free channel of economic possibility according to supply and demand.

Through this plan free competition was assured for sugars coming from any quarter and this was the beginning of the upswing of the Java sugar industry, and a proper reward for all the strenuous labors and sacrifices in the past years, the free competition being such that Java could profit thereby. While many other countries had just begun a renewal and an enlargement of the industry, Java was prepared and ready to enter and appear on all markets. This is apparent when it is noted that in 1903 the sugar production was 950,000 tons while in 1913 it had risen to 1,465,000 tons.

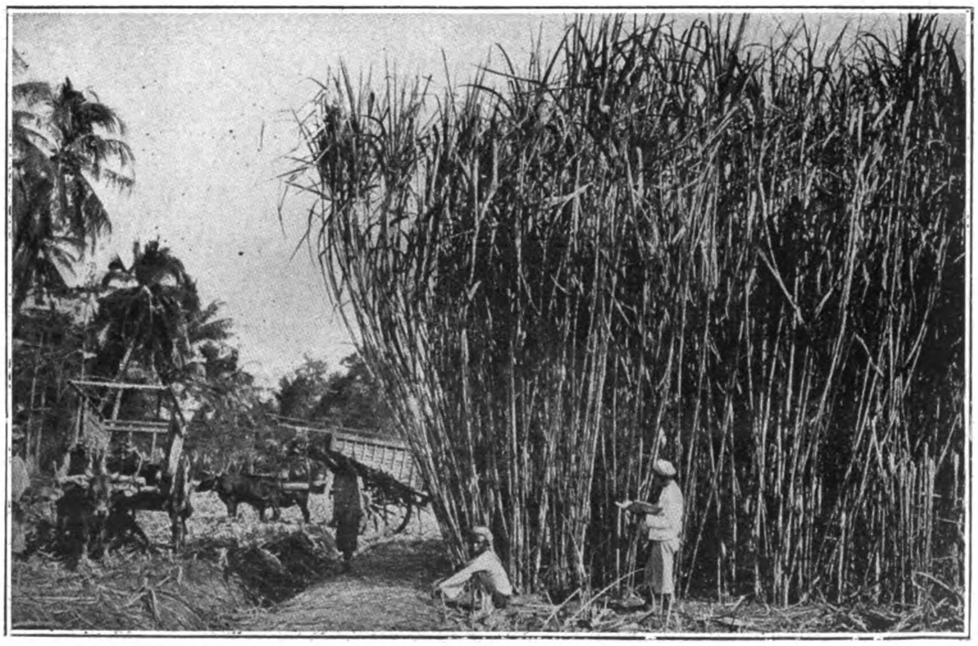
During all these years many things have happened. In the first place the large measure of success was due to the bringing in of new cane varieties, which were decided upon after various experiments with the seed, bringing about the expansion of the planted area and a greater certitude of results in which the Cheribon cane variety majored as being freer from disease than most other canes. In the second place, in the period from 1893 to 1903 Java produced great quantities of raws which found their way to the United States but with the rejuvenation of Porto Rico and Cuba the doors were closed, the last two named countries being the neighborhood to furnish the refineries with plenty of raw material. Other markets had to be found and British India was opened where immediately after the Brussels convention the white crystal sugars from Germany and Austria were crowded out through the white sugars from Java. At the beginning, the different varieties of sugar were only made on a small scale but in the last few years with the increased production one half of the outgoing Java sugars were white crystals going to British India, Great Britain, France and the countries around the Mediterranean Sea.

The years following 1900 show that there has been an increase in quantity and quality and though the prices were not always what was desired yet prior to the war of 1914 the industry enjoyed a period of well being and prosperity. It is not to be wondered at therefore that the prosperity of the industry awakened suspicions and that repeatedly charges were made against it, that the industry tried to take advantage of certain agrarian conditions, such as renting of lands, obtaining irrigation waters, lowering of wages, etc., thereby seeking to justify its own existence.

At a hearing of the commission of inquiry looking into the diminishing prosperity of the domestic populace between the years 1894 nd 1908 it was repeatedly apparent that a feeling existed which could not be rectified because the sugar manufacturers, being in the minority, could not or would not be heard, being unable as citizens to give their own views.

In order that such a minority might better its position, the manufacturers closed a combine in 1894 and called it the "Algemeen Syndicat van Suikerfabrikanten of Java" open to all engaged in the industry. In 1907 the syndicate had the satisfaction of acting as official commission to the government in matters of the sugar industry in Netherland-India, acting as advisor, thus becoming a voice for its own interests. In the year 1906 it took over the sugar magazine *Archiev voor de Java Suiker Industrie* which had existed since 1893 and since the year 1912 it has also directed the experiment station for the Java sugar industry besides administering different funds related to the industry, thus expressing the fellowship of the producers of Java, putting the sale of sugar into one selling agency.

August of 1914 the great European war broke out and the crop was about half sold and did not bring the highest prices. The British royal commission for provisioning sugar during the years 1914, 1915 and 1916 procured large quantities of sugar on the Java market which prevented the industry from having any causes of worry. Then in 1917 a change came when the commission began to receive consignments of sugar from other countries. A large boat tonnage had been destroyed by submarines and the allies



Harvesting sugar-cane in Java

were crowded for provisions and had to practice economy with their boats. The powers agreed not to send ships to Java to bring sugar to Europe and decided to bring all necessary needs from Cuba and the United States. British India and Australia were not in need of large quantities because they were reducing their sugar rations also.

The result of this was that the warehouses in Java were full of sugar and the individual men were inclined to stand off the prices then current for sugar. The one class that seemed to have an advantage were the profiteers who hoped to play one owner against the other to lower prices, but the holders addressed themselves to the Java sugar combine and were protected. This combination was better able to stabilize prices and to steer the crop of 1918 better than individual holders could. Thus prices were stabilized; those who wanted to take advantage of the situation were not large enough in numbers to drive out the combination and even though the new crop of 1918 was approaching and the visible supplies of the splendid crop of 1917 were still in part on hand, the prices remained stable, in keeping with the situation.

The hardest blow came when in March of 1918 the allied powers requisitioned the Netherland ship tonnage and therefore hindered the exportation of sugar to neighboring lands. Through the selling combine in the Netherlands, the quantities of sugar were moved in three months, 90 per cent. of the sugar producers of the "Vereennidge Java Suiker Producenten" assisting. The latter society held the remainder of the 1917 crop and the whole output of 1918 and therefore had a hand in the disposal, which action made prices firm even though certain doors were closed.

The cessation of the intercourse of Java with her neighboring lands heightened the discontent because rice could not be brought from British India and Siam and thus the food supply was reduced. Though the scarcity was not as great as in the motherland yet it gave rise to all sorts of excitement and revolutionary spirit, causing grave concern. One consequence of this spirit was an order to reduce the amount of irrigation waters for crops by 20 to 25 per cent. but fortunately this was not carried out. A number of owners of sugar factories were practically ready to enter upon this restricted irrigation, in fact the figures show that the area in 1919 was 36,000 *bouws* (.709 hectare) or 16 per cent. less than the year before, but this was the result of anticipation and was voluntary, and naturally the output was thereby reduced.

At the time of the armistice in November, 1918, immediately a new condition was at hand; with one stroke the borders hemming in the Java industry fell away and with a magic hand the crop of 1919 was distributed, arriving in the countries for which the sugar was destined. The former area was nearly reached again in 1920, but strikes and cane fires, largely the work of men of the revolutionary spirit, retarded matters some.

The great success of the Java sugar industry since being freed from governmental regulation is not due to government aid or support as is the case in some sugar exporting lands, but is the result of the solidarity of all interested who do not look upon each other as competitors but who work together with energy, open heartedness and integrity, trusting one another, sharing each others burdens and difficulties and unanimously putting their hearts into the work of an industry dear to all.—S. G. Ruegg, in "*The Louisiana Planter.*"

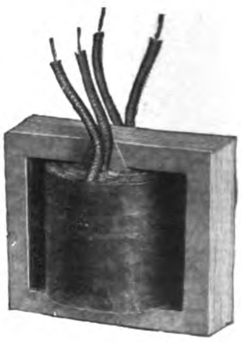
Japan's Railway Extensions

The railway line along the coast of the Japan Sea will be perfected with the completion of a line between Nezumigaoka and Murakami stations on the Uyetsu line under the control of the Sendai district bureau when thorough traffic will be opened from Aomori in the north to Shimonoseki as its southern terminal. The work of connecting the two stations is now going ahead and the authorities expect to complete it during the present year. According to the railway authorities, the government is extending the imperial railway lines by roughly 300 miles a year and the average increase in the number of stations is about 80 a year. For these extensions about Y.50,000,000 is spent each year.

Kellogg Transformers Move Fast and Satisfy

"Quality in radio music depends largely upon the characteristics of the audio-frequency transformers employed. It is usually the amplifying transformer that determines whether the received programs will be music or noise."

WITH the above pre-determined facts in mind, the engineers of the Kellogg Switchboard & Supply Company were given the problem of producing an audio-frequency transformer which would accurately repeat music and speech. It was soon determined by them, on test, with all types of transformers available, that no one had solved the problem of true reproduction through an audio-frequency transformer. The difficulty involved in designing an audio-frequency transformer, it was found, was a problem of providing a transformer that would function equally as well on the low (or bass) voice, as on the high frequency (or 5th position of the violin).



Experts on both sides of the continent were interviewed with the idea of obtaining from them some valuable data. Universities, where very delicate testing apparatus is available, were also called upon to assist.

Figure "1" shows the winding that was finally developed, and found to be the one most efficient for Kellogg transformers. Its problems involved the finding of the proper thickness of paper, the proper kind of insulated wire to provide the correct number of ampere turns, and impedence.

Figure "2" illustrates the one-piece laminations of silicon steel, showing the lack of punched holes, which in many other transformers causes eddy currents and losses This one piece lamination is exclusively a feature of the Kellogg transformer. It provides an exceptionally true electromagnetic core. The steel is a special thickness and undergoes special chemical analysis.

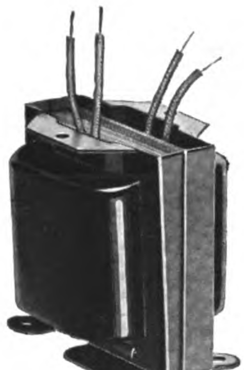


Figure "3" illustrates the enameled brass housing or shielding. To correctly shield these transformers that they may be mounted in any position desired without losses, this brass shield was designed. It is so arranged that both sides are inter-changeable, locking together at the base.

Figure "4" shows the complete transformer with leads trimmed and soldered to punched and tinned terminals, which are under the nickel-plated knurled screw heads, complete and ready to be installed in your set in short order.

Note carefully that all provision has been made to protect these leads against breakage in that they are soldered to the terminals in plain sight where they may be inspected. Many transformers to-day with enclosed terminals are soldered with soldering paste which in time causes deterioration and "opens." This is entirely overcome in the Kellogg transformers.

Each binding post is plainly marked so that it is impossible to make incorrect connections.

Mount Mayon and the Town of Legaspi, Albay Province, Luzon

Manila Railway Report

Operating Revenues Drop Nearly a Million Pesos

THE Manila railroad company made a net profit of P.1,285,275.93 in 1923, according to the annual report of General Manager Jose Paez to the stockholders and board of directors recently made public. This net gain, however, is lower than that of 1922 by P.996,042.77 or 43.66 per cent., the report shows.

The management has been able to reduce the operating expenses, which in 1922 amounted to P.7,300,646.83, to only P.6,867,257.43 last year or a saving of P.433,389.40, according to the report. This saving is nevertheless offset by the fact that the operating revenues in 1923, amounting to P.11,505,525.51, were lower by P.705,272.26 than those of 1922 which amounted to P.12,210,797.77.

Dividends Inadvisable

Until all needed improvements indispensable to the economical and efficient operation of the railroad are undertaken the general manager considers it inadvisable to consider diverting any portion of the earnings for the purpose of paying dividends.

During 1923, the report points out, there was in use 1,047.132 kilometres of single track rail, and 13.386 kilometres of double track or a total of 1,060.718 kilometres. There were also operated 155 locomotives and 2,144 cars and coaches of various kinds. The company undertakes the location of 70 additional kilometres of road in its southern lines, thus leaving a distance of 37 kilometres yet to be located of the proposed line which will link the Legaspi division in the Bicol region with the main southern line ending at Aloneros, Tayabas province.

Explaining the decreases in revenues and expenses the annual report states :

Revenues Decrease

" The decrease in total operating revenues of 15.8 per cent. indicates a slight decrease in the volume of traffic handled during the year 1923 as compared with 1922. It will be noted that operating expenses were only reduced by P.433,389.40 while operating revenues were reduced by P.705,272.26. As is usually the case, the cost of doing a smaller volume of railroad transportation business did not decrease as much as the decrease in the total operating revenues. In other words, in relatively poor years revenues decrease faster than expenses and in good years revenues increase faster than expenses. However, it should be noted further that the ratio of decrease in expenses (5.9 per cent.) was slightly greater than the percentage of reduction in revenues (5.8 per cent.) The operating ratio (proportion of operating expenses to gross operating revenues) was 59.69 per cent. for 1923 as against 59.79 per cent. for 1922. This is rather surprising in view of the reduced revenues, but is a result of the fact above stated that expenses decreased in a slightly greater proportion than the percentage decrease in revenue, *i.e.*, $\frac{1}{10}$ of 1 per cent. although the reduction in revenues (P.705,272.26) was P.271,882.86 more than the reduction in expenses (P. .433,389.40).

Non-operating Income

" The large reduction in non-operating income of P.74,264.67 (31.78 per cent.) deserve special mention. This is due to the fact that in 1922 the sum of P.142,480.22, representing premium on sale of sinking fund bonds less expenses incident to their flotation, was credited to non-operating income, and this was only partially offset by increases in 1923 in various items of non-operating income.

"The total net profits of P.1,285,275.93, while smaller by over 43 per cent. than in 1922, indicate that the Manila Railroad Company is gradually working into a sounder position financially and was able to save a fair proportion for net out of its gross revenues considering the several adverse factors with which it had to contend during the past year.

"As has occurred for several years previously, passenger revenues show the greatest reduction as compared with other items of income. However, the decrease of P.402,099.59 is P.123,244.61 less than the decrease in 1922 from 1921. The number of passengers carried in 1923 was 6,015,382 as compared with 6,501,363 in 1922, a decrease of 485,981 or 7.4. per cent . . . It is hoped that possibly the limit in decline has been reached and that in the future passenger revenues at least will hold their own if not show improvement. The total revenue freight tonnage for 1923 shows a decrease of 57,314 tons from 1922 or 4.9 per cent.

Water Lines Prosperous

"Considering the decreases in passenger, freight and express revenues, it is encouraging to note that the operation of the water lines show increased receipts of P.31,479.68 or 17 per cent. making operating income for 1923 P.206,068.54. This resulted in a net gain of P.32,799.07 as compared with a loss in 1922 of P.5,856.93 which in turn was preceded by a loss on operation of approximately P.88,000 in 1921."

At the beginning of the year 1923, the report states, the financial position of the Manila Railroad Company presented a marked contrast to that at the beginning of 1922, when there were unsettled pressing obligations amounting to between P.3,000,000 and P.4,000,000 with almost no funds available to discharge them.

The situation in 1922 is ameliorated and the crisis averted by the placing of P.3,000,000 bond issue in the United States and consequently at the beginning of 1923 as a result of the step taken and the current receipts from operation, there was a cash balance on hand of P.1,420,370.96, and all obligations in the shape of bond interest notes, bills for coal and other supplies had been met when they became due.

Improvements Needed

"While it is true that the operating expenses of the company have decreased from the peak reached in former years," the report explains, "it is believed that the rates charged should be sufficient to secure an income adequate to produce a reasonable profit on capital invested. This fund can then be devoted to urgent improvements and betterments that are essential for the economical and efficient operation of the railroad without repeatedly seeking outside financial assistance in the way of bond issues or other indebtedness which continuously increase the fixed charges of the company.

"It is firmly believed," the report also avers, "that the rate structure should be maintained at such a point as to insure the ability of the company to earn a reasonable amount over and above operating expenses."

Regarding traffic conditions in 1923 the general manager says in his report that they have not materially changed from those of 1922 except that competition has been felt more acutely and there have been greater losses from auto-truck operations affecting passenger, freight and express earnings. The long haul business, it is pointed out, has increased while the short haul traffic has decreased. Difficulties met through keen competition of truck services were in part overcome through reduced rates by means of round-trip tickets.

Recommendations Made

Recommendations made in the report follows:

1. Increase in capital stock through floating by the insular government of P.14,000,000 worth of bonds. This would be used in the purchase by the government of 70,000 shares of the company which fund is in turn to be used by the company for needed construction and extension work such as the Aloneros-Pamplona line in the Bicol region, the Bauang Sur-San Fernando, La Union and the San Quintin-Tayug, Pasgasiman.

2. Short term financing: Arrangement of loan of P.2,000,000 from postal savings bank and teacher's pension fund on proper legislative authority to be paid in annual installments of P.500,000 with interest at the rate of 6½ per cent. in four years time. This is to be used in needed improvement of present lines and betterment of present facilities and services, which would ultimately reduce cost of operation. Among projects for which these loans are intended are raising of road-bed above flood level, prohibitive grades and additions to rolling stock.

3. Sinking Fund: Setting aside reasonable amount each year for the creation of sinking fund for redemption of bonds.

4. Appropriations from surplus earnings: Income in excess of ordinary requirements be utilized in the financing of general improvements and betterments. The late Manager McCoy estimated that P.11,000,000 could be expended with great benefit to property in improving existing facilities.

Operating Revenues and Expenses

Total operating revenues for 1923 were	P.11,505,525.51
As against that of 1922	12,210,797.77
A reduction of 5.8 per cent.	705,272.26
Total operating expenses for 1923 were	6,867,257.43
As against that of 1922	7,300,646.83
A reduction of 5.9 per cent.	433,389.40
Total operating income for 1923 was	4,577,631.23
As against that of 1922	4,887,748.32
A reduction of 6.34 per cent.	310,117.09
Total non-operating income from 1923 was	159,430.44
As against that of 1922	233,695.11
A reduction of 31.78 per cent.	74,264.67
Total fixed charges and other deductions	2,739,056.67
As against that of 1922	2,778,917.16
A reduction of 1.43 per cent.	39,860.49
Total net income for 1923 was	1,998,005.00
As against that of 1922	2,342,526.27
A reduction of 14.7 per cent.	344,521.27
Total income applied to Sinking Funds	570,233.00
As against that of 1922	4,488.00
An increase of 12.600 per cent.	565,745.00
Leaving a net balance transferable to Profit and Loss Account in 1923 of	1,427,772.00
Ae against that of 1922	2,338,038.27
A decrease of 38.9 per cent.	910,266.27
Total net profits after deducting profit and loss adjustments for 1923 were	1,285,275.93
As against those of 1922	2,281,318.70
A decrease of 43.66 per cent.	996,042.77

The Philippine Railway Co.

The 18th Annual Report by V. Pres. R. R. Hancock

FOLLOWING is the report of the operations of the Philippine Railway Company's lines in the islands of Cebu and Panay, Philippine Islands, for the year ended December 31, 1923:—

Total operating revenues for the year amounted to $618,672.13, as compared with $643,232.02 for the year 1922, a decrease of $24,559.89. Operating expenses amounted to $488,989.95 as compared with $473,464.76 for last year, an increase of $15,525.19. Net earnings were $129,682.18 as compared with $169,767.26, a decrease of $40,085.08. Freight earnings were practically the same as for the year 1922. Passenger earnings fell off $24,377.51; other transportation revenues decreased by about $3,000, and incidental revenues increased by a like amount. The ratio of expenses to revenues was 79.03 per cent., and for the previous year 73.61 per cent.

Passenger business has been steadily falling off for the past several years. This is due to a decline in the number of people attending the town festivals, and to the very large number of automobile trucks and small cars operating in competition to the railway over the excellent roads which parallel our Cebu line for its entire length, and for some thirty kilometres at each end of the Panay line. These cars also handle more or less freight. The automobile rates are fixed by law, but as there is practically no enforcement of the regulations, they charge a few centavos less than the railway whenever this is necessary to secure the business.

In order to meet this competition, we have established a more frequent train service on both divisions. One daily train over the entire division was added to the Cebu schedule. The service from Iloilo to Pototan, a distance of thirty-three kilometres, was increased by three daily trains, and on the north end a Ford track auto truck and trailers with capacity for seventy-five passengers makes two trips daily to Buntog, an important town thirty-seven kilometres out from Capiz. On the Cebu division the competition is very keen, and it was deemed advisable to reduce the passenger fares to the rates in effect before the increases made on account of war conditions. The rates had been increased thirty per cent. The reduction was made in September, and we are now carrying a much larger number of passengers, and the revenues have materially increased. It does not seem desirable to make any reduction in rates on the Panay division.

Less Coal Mined

The coal mines on Cebu are not producing as much as in previous years. The output of the National Coal Company was about normal. The Danao mines are getting out a very small amount. All the Uling Company produces is taken by the Cement Company without passing over our line.

The sugar central located on the Panay division is having a successful season, and will produce about 3,800 tons of sugar. There is every prospect that this amount will be doubled next year. The mill will be altered to take off six hundred tons of cane daily, instead of four hundred as at present. We are applying for government authority to purchase fifteen cane cars to handle the crop.

Our cane tariffs must necessarily be low per ton kilometre, as the average haul is twenty miles. The railway freight rate is about sixty cents for each ton of cane delivered at the mill. We charge $3.60 freight per ton of sugar, and obtain a fair revenue from the incidental business. Sugar development is only starting on Panay. There are large areas of excellent sugar land still untouched, and with the success of the Negros centrals and the one on Panay, there is reason to believe that other mills will be erected along our line.

The cement plant on Cebu commenced operation the latter part of the year, and is producing about one thousand barrels a day, which is shipped over the railway to Cebu. This is a well-equipped, modern plant and produces cement of excellent quality which finds a steady market. Two recently completed irrigation systems supplyin3 water to fifteen thousand acres of rice land are in successful operation near Iloilo, part of the territory being tributary to the railway.

Operating Expenses

Total operating expenses for the year were $15,525.19 greater than for 1922. The wages of our employees and the costs of ties, coal and all other materials are about double the prices of ten years ago. There is little prospect of a reduction in these items due largely to the increased demand caused by sugar centrals on the adjoining island of Negros for mechanics, track men and materials produced locally. Tracks, buildings and equipment now require more repairs than during the first few years after construction was completed.

Total expenditures for track labor and material amounted to $139,308.32, an increase of $2,157.34 as compared with last year. Tracks, bridges and buildings were well maintained, and replacements were made where necessary. The condition of the wooden tretles on Panay was much improved.

Expenditures for maintenance of equipment amounted to $90,310.32, a reduction over the costs of the previous year of $2,438.52. Nine locomotives were overhauled and twenty cars were rebuilt or extensively repaired. Next year four locomotives will receive heavy repairs and thirty cars will require rebuilding. One of the Panay power house boilers was partly renewed, and all equipment was kept in a good state of repair. Three steam tugs and six small barges are operated. Two tugs and three barges are for transferring the company's own freight and for miscellaneous work in Iloilo harbor.

Transportation expenses increased by $15,579.70 over those of the previous year. There was a considerable increase in coal consumption and wages of train crews due to the increased train service. Total locomotive kilometreage amounted to 583,924. Fire damage claims on Cebu amounted to $6,961.28 for several houses alleged to have been burned by sparks from the switching engine.

Total locomotive fuel consumption for the year amounted to 9,136 tons of coal and 398 cords of wood. All the coal used by locomotives on Cebu, amounting to 4,044 tons, was purchased from the local mines at a cost of $8.34 per ton on pile. On Panay we used 3,429 tons of Australian coal, costing $11.50 per ton on pile, and 1,663 tons of Chinese coal at $9.25 per ton on pile. On account of the silting up of the Iloilo river, all coal purchased for the Panay division must be lightered from the straits at a cost of $1.60 per ton from steamer to pile.

The following tabulation shows the costs and consumption of fuel used on locomotives for the past two years:—

	1923	1922
Total value on tank	$98,193.09	$88,598.22
Cost per ton on tank	9.98	11.89
Total consumption, kgms.	9,334,579	7,449,461
Total locomotive kilometreage ..	583,924	444,966
Consumption per locomotive kilometre, kgms.	15.99	16.74
Consumption per 100 ton kilometres, kgms.	10.21	9.90

Expenditures for additions and betterments amounted to $4,319.81. These additions consist of a new water station in course of construction on Cebu; a steel dock derrick partly completed on Panay; and two track auto trucks and trailers for service out of Capiz. One lighter carried on our books at $3,500 was lost at sea, and another carried at $1,500 was scrapped. These lighters were purchased several years ago for use in wood service and more than paid for themselves in reducing the cost of fuel during the high price of coal. One trespasser was killed by a locomotive, and a passenger was severely injured by jumping from a train. Two road automobiles were struck by locomotives and six persons slightly injured. The Railway Company was held blameless in each instance.

The interest in the outstanding 4 per cent. first mortgage bonds of the Company amounted for the year to $341,960.00; of this amount, the Company was able to provide from earnings, after appropriating $4,319.81 for additions and betterments, $125,714.88, or 37 per cent., and the Philippine government, in accordance with the contract of guaranty, advanced the balance, or $216,245.12. The total of advances made by the government to December 31, 1923, to meet interest on bonds is $3,509,653.63, repayment of which is not obligatory until after maturity and repayment of bonds.

The following are the equivalent values of the units in this report:

One Ton	=	1,000 kilograms = 2,205 pounds.
" "	=	1,000 litres = 264 gallons.
" "	=	(freight meas.) 2 C.M. = 70 cu. ft.
One Kilometre	=	0.62 miles.
One Mile	=	1.61 kilometres.
One Metre	=	39.37 inches.
Two Cords of Firewood	=	1,000 kilograms coal.

Machinery Demands

The demand for woodworking machinery and equipment has increased considerably in Canton during the past two years, according to Vice-Consul Howard Bucknel, Jr., Canton, China, and is credited to the increasing cost of labor which is forcing producers to use labor-saving devices. The largest consumers of this class of machinery are the government in its arsenals, airdromes and railway shops, which use band saws, planers, tenoners, and other special woodworking machinery. The local match works imported a number of circular, swinging, cut-off and band saws, while the local cement plan has in use a number of machines for barrel making.

Labor shortage in India has greatly stimulated the use of coal-cutting machinery in the Indian coal mines, according to report to the department of commerce from Trade Commissioner C. B. Spofford, Jr., Calcutta. Most of the large collieries in the various fields are now equipped with electric power. Forty electrically driven coal-cutting machines were in operation in the Ranesgunge and Jherria fields and during 1922 these machines cut a total area of 1,065,456 sq. ft. In addition, three machines operating on compressed air cut 190,890 sq. ft. in the Jherria field. One colliery has introduced a mechanical loading conveyor which operates by compressed air. A movement is now on foot to increase the coal carrying capacity of the railways and also increase the output of the mines.

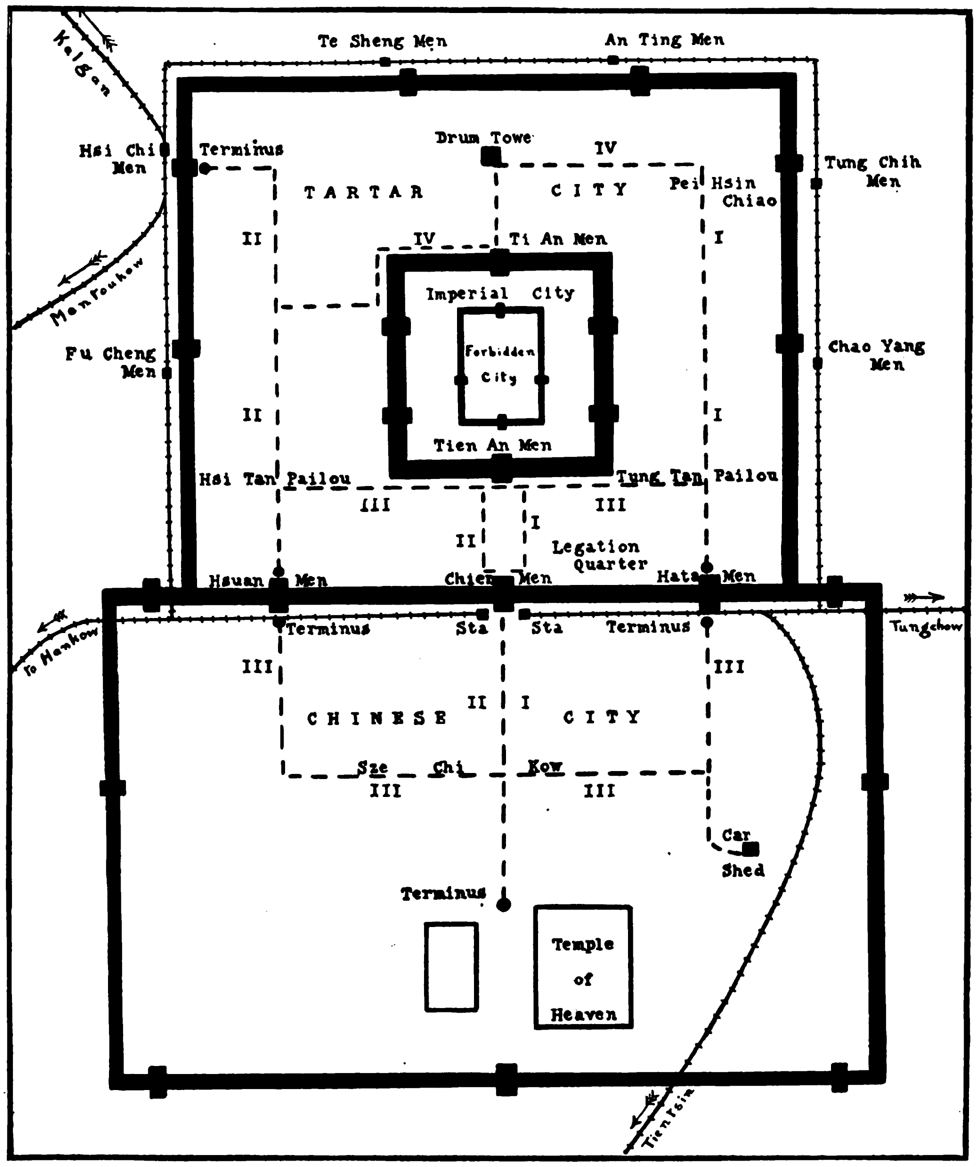
The Peking Tramway System

Modern Developments in the Ancient Capital of China

By Laurence Impey

IT is over ten years now since the first agreement relating to the construction of tramways in Peking was signed by the Chinese ministry of finance and certain French interests represented by the Banque Industrielle de Chine, and it is an excellent example of the Oriental policy of *laissez faire* that even now the completion of the undertaking is not really in sight. It is true that some of the construction work has been done, and that at the present time some fifty kilometres of track has been laid, but the rest of the installation is proceeding in so leisurely a manner that it will probably be necessary to commence repair work on the first stages before the last ones are in place. The initial delays to the work were undoubtedly political in their origin, and if a full account of these is ever made public it will afford an interesting insight into the peculiarities of commercial enterprise and development as practised in China.

The scheme as originally outlined in the port of Pukow agreement was feasible enough of course, and it was presumably only the outbreak of the war that prevented its being put into execution immediately, but this unexpected development, by the pressure which it exercised on French finance, naturally altered the whole trend of affairs and caused the agreement to be held in abeyance until the spring of 1921, at which time a new contract was drawn up and signed by the ministry of finance and the Banque Industrielle de Chine.



Map of Peking Tramway System

The fact that such a profitable undertaking had been secured by French interests had of course considerably disappointed various other financial and engineering groups, and the hindrances in organization presented by war conditions afforded an excellent opportunity to these disgruntled competitors of which they were not slow to avail themselves. The opposition was considerably strengthened by the financial difficulties of the Banque Industrielle during the latter years of the war, and it was apparent that the climax had been reached when in May 1921 the Banque was forced into involuntary suspension.

The first move to follow was the appointment of a German engineer to take charge of the work on behalf of the company, and this event produced reactions which have proved to be of the utmost importance since. Specifications were immediately drawn up for the materials required and these were so worded by the engineer as to comply with standard German construction work, thus enabling German firms to submit tenders in the short space of time allowed and greatly hampering other foreign firms who were desirous of submitting plans and bids. In spite of the fact that French interests eventually regained the supremacy this action was of vital importance in the long run, as is evidenced by the number of tenders which were secured by Germans in the face of considerable opposition. The following short list gives some idea of the predominance of Germany along certain lines in engineering construction in China, and may serve to disprove those assertions which have lately appeared in the press to the effect that German commercial and financial interests in the Far East are almost negligable in importance.

Contract No. C.—Convertor Station Transformers. Siemens-Schuckert & Co. (German)

Contract No H.—Winding Shop. Siemens-Schuckert & Co.

Contract No I.—Joinery, Shop. Chinese Commercial Corporation. (Kirchner) German.

Contract No L.—Repair Shop. Siemens-Schuckert & Co.

Contract No N.—Overhead Line Equipment. Siemens-Schuckert & Co.

Contract No F.F.—Transmission Signals Equipment. Siemens-Schuckert & Co.

Contract No K.K.—Precision Testing Instruments. Siemens-Schuckert & Co.

Examination of the complete list of tenders shows that the German group have secured seven to the French four, the British having obtained six and the Chinese the same number; and it is reasonable to suppose that the French interests that now control the work would not have approved this if it had been possible for them to arrange for some emendation or to call for fresh tenders.

The financing of the scheme has involved considerable difficulty owing to the suspension of the Banque Industrielle, for the original arrangement was that the shareholders should provide one half of the funds required, while the ministry of finance, representing the Chinese government, should not be liable for any direct payment but should be carried by the Banque acting as its financial representa-

tive. The first and second calls issued by the company amounted to two million dollars, the third one called for another five hundred thousand, and up to April 1924 a total of four million dollars Mex has been called up and expended, while the directors are now considering the adviseability of asking for another million dollars in the immediate future.

It is somewhat surprising, when one considers the unsettled conditions in China, that the private shareholders have been willing to provide such an amount, secured as they are only by the materials of the tramway itself and certain of the municipal taxes of Peking, which might very well not be forthcoming in case of necessity. These financial details are, however, of somewhat secondary importance, for the tramways are now in the nature of a "fait accompli" and it is far more interesting to consider the actual engineering and construction details of the work now under progress.

The general plan of the system is to install a power plant at Tungchow, some sixteen miles from Peking, and by obtaining water from the upper reaches of the Pei Ho and passing it through a large settling tank enable them to operate three Babcock & Wilcox water-tube boilers for the turbo-generators. These boilers have a heating surface of 4,400 square feet and a working pressure of fourteen atmospheres (210-lb. pressure). They are fitted with economisers and chain grate stokers. The three turbo-generators which were supplied by the Swiss firm of Brown Boveri & Co. will provide 3,000 kilowatts, one being of 1,500 kilowatts and the other two of 750 kilowatts apiece ; while space has been reserved in the building during construction for the installation of another group of 3,000 kilowatts which it is expected are to be ordered shortly. The generated voltage of 5,000 volts is stepped up to 33,000 volts for transmission from Tungchow to Peking by extra high-tension cable, and is stepped down again at the Peking transformer station close to the Hatamen gate. The total cost of the installation at Tungchow is in the neighborhood of $200,000, while the buildings for the housing of the engineering staff, together with the settling tank which is not yet erected, will cost another $200,000.

The current from the transformer station at Hatamen is passed to the two convertor stations at Nan Ho Yen and San Li Ho in the south and north Tartar city respectively. Here it is converted from alternating to direct current, the south station having two Hexaface rotary convertors with a capacity of 375 kilowatts at the D.C. side and a voltage of 615, while the north station has two Hexaface rotary convertors of compound winding with commutating poles and a capacity of 225 kilowatts at the D.C. side and a voltage of 615 as in the other installation. These two stations are not yet completed, but it is expected that they will be working by August next if not earlier. The capacity of the whole of the electrical plant both at Tungchow and in Peking is well above the requirements of the tramway system as at present projected, but it is expected that there will be an ever increasing demand for its services once it is operating, while it is also suggested that it might be possible to use the surplus current for an electric light supply in the future, the present one being somewhat inefficient, both in capacity and operation.

The laying of the track has been completed already, the rails used being of the grooved type with a weight of forty-seven kilogrammes per metre, though a lighter type of trail has been employed for the track to the car sheds and repair shop. The joint for the rails is made with the usual fishplate and an electrical joint of 50 m.m. copper wire, electrical thermit welding such as is used in America and England not being practised in China as yet owing to the lack of equipment and skilled workmen. It is very unfortunate that the surfacing between the tracks is not of better quality, the stone from the western hills quarries proving to be somewhat soft and yielding very rapidly to motor traffic, while the harder stone which has been employed in some parts of the work does not amalgamate well with that of the road previously constructed by the municipality. It would appear that some difficulty may arise on this point, for the understanding is that the tramway company is responsible for maintenance only on the portion of road occupied by their track, which will result in dual repair work being undertaken with an inefficient joint resulting at the point of contact.

It is obvious that there must always be troubles encountered in such an undertaking, where a modern enterprise is grafted onto the organization of an ancient city, and this is the case in more ways than one in Peking, for not only have the ancient and uncharted city sewers put in by Chien Lung cropped up here and there to obstruct the track work, but the old wooden pailous which have ornamented the streets for so long have proved to be too low and too narrow to permit of the passage of the tram traffic, and in two cases at Hsi Tan pailou and Tung Tan pailou they have had to be removed altogether. This traffic difficulty has again been encountered at the passage of the city gates at Hatamen and Hsuan Men, for the gate is here so narrow that in any case it would only be possible to use a single track and this would obviously impede both the ingoing and outgoing vehicles at the same time. Added to this there is the fact that at Hatamen the track would have to cross the Peking-Mukden railway at street level, and at present it has not been possible to obtain the consent of the railway company to this, so that the tramway line has had to use a terminus both inside and outside the gate. The same thing applies to the track at Hsuan Men, only in this case it is even more difficult to operate satisfactorily from the fact that the existing road beside crossing the railway also makes a right angled turn in the approach to the city gate through a bastion, thus rendering a through line impossible without destroying a portion of the city wall, which is not likely to be approved by the authorities under the present unsettled political conditions.

Thus it will be seen that the routes as laid down on the plans and numbered from I to IV are to a certain extent provisional, and may particularly require modification in regard to route III, on which passengers will have to change cars en route to the Tartar city or *vice versâ*. The total length of the whole system is approximately thirty two kilometres, but in all over fifty kilometres of track will have been laid when the work is completed and the sidings and branches to the car sheds are put in. The sheds themselves are not yet finished owing to an error in construction on the part of the Chinese contractors, but it is estimated that they will be ready by August and will then have a capacity for one hundred and twenty cars in all, of which number sixty trailers and thirty motors are now on hand and in process of assembly. The repair sheds are in the same stage of progress and the total cost of the two buildings will be approximately $190,000. The cars to be used are the *Brill* type 21 E, and each is fitted with a 30 horsepower motor of 550-600 volts D. K. type. The brakes are both hand and electrical and are fitted by a French firm and are therefore not of the usual Westinghouse pattern.

The cars themselves are divided into two by a sliding door, the first class having a capacity of ten passengers seated and six standing in the forward portion, while the second class takes eighteen passengers seated and twelve standing in the rear part of the car. As the traffic increases the trailers will be attached to the original cars in order to cope with the extra numbers. What the fares in the different classes are to be is not yet finally decided, but it is thought that the length of a stage will be approximately six hundred metres, and from this one may make a rough estimate as to the possible cost of transportation. A rickshaw fare for the same six hundred metres in Peking would be about six coppers or slightly under ten cents a mile, and it would be necessary for the tramway company to underbid this charge if they really expect to cut out the rickshaw service, which it would seem must still be used in a number of cases owing to the fact that a large percentage of journeys do not follow the main roads altogether, but pass across them from one small hutung to another.

There will however be a considerable passenger traffic from all parts of the Tartar city to the main business centre outside Chien Men, and also from all parts of both the Chinese and Tartar cities to the railway stations at both Chien Men and Hsi Chih Men, while the theatre district in the area north west of the Temple of Heaven will doubtless be responsible for extra traffic at certain times of the day. As most of these journeys will be long distance runs where time is an essential the trams will probably take very much of the work in this direction which is at present handled by the rickshaws somewhat unsatisfactorily, leaving them the monopoly in short distance hauls where the time saving to be effected is inconsiderable.

It will be interesting to note how the receipts of the tramway company are handled a few months after opening up, for of course these receipts are primarily responsible for the payment of shares and the maintenance of the rolling stock and track, which would not seem to leave overmuch for the customary Chinese " squeeze " on the part of the various officials of the metropolis, unless, as is more than probable, the system is allowed to deteriorate slowly and surely after the manner of most foreign innovations and installations in China when they fall into the hands of the Chinese themselves.

The Tsingtao Waterworks

By I. H. Pei, M.C.E., Member, A.C.A.E.

Civil & Sanitary Engineer, Public Works Department, Tsingtao

Paper Read Before the Association of Chinese and American Engineers

Introduction

IN 1922, the writer was attached to the commission for the rehabilitation of Shantung rights, headed by Dr. C. T. Wang, and his mission was to look after the technical side of the Tsingtao waterworks properties preparatory to receiving them from the Japanese directorship. The data presented herein are taken principally from the notes and reports collected during this investigation.

It is hoped that this paper may serve as a source of general information to the Association as well as to the general public. The important question of the extension of the supply system in the immediate future is considered; and an attempt is made to bring to the attention of the engineering profession the necessity of an adequate laboratory for water analysis.

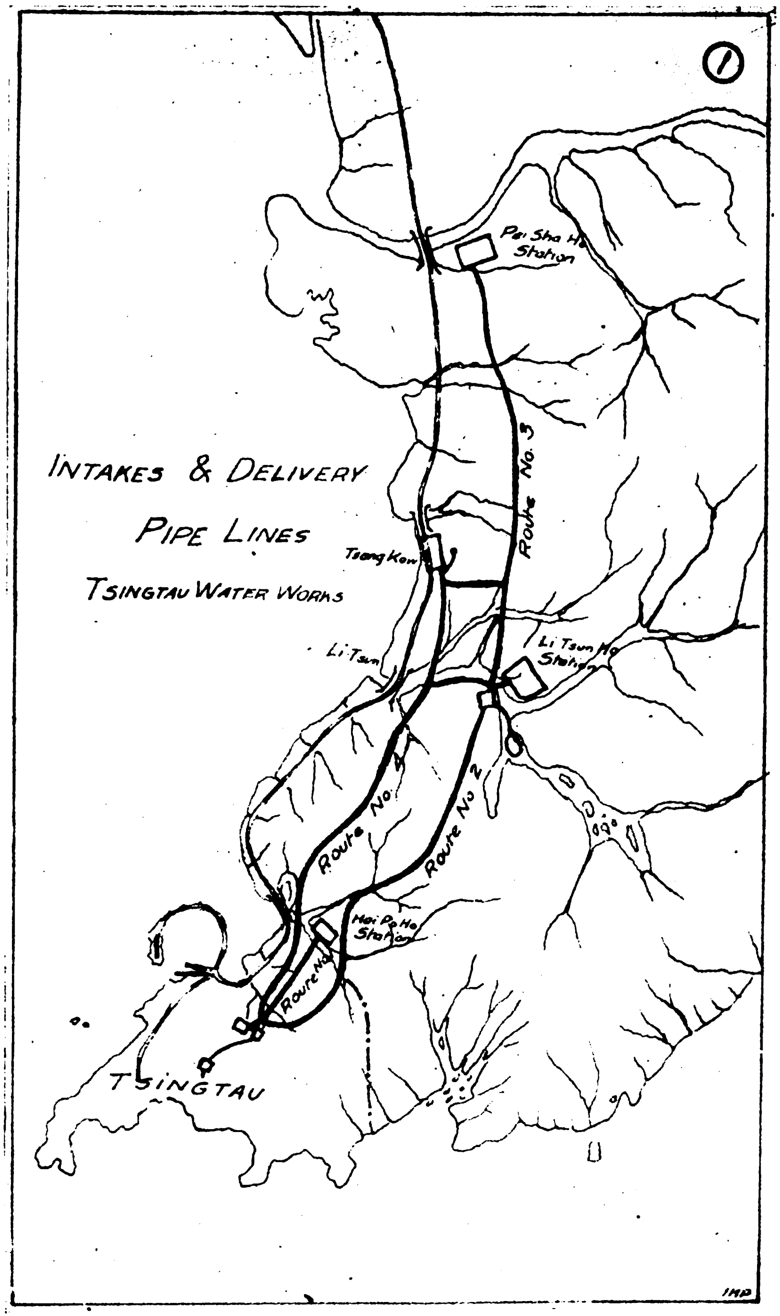
Data on the Tsingtao waterworks published in English are very meager as far as the writer knows, and he regrets that this paper is by no means a complete one.

Sources and Pumping Stations

Sandy rivers and hilly topography characterize the country about Tsingtao. On account of the heavy run-off and the enormous percolation, finding an adequate surface water supply with a reasonable investment was considered impossible. The present method of supplying water by sinking wells in the sandy river bottom or along its bank solves the problem in an exceedingly satisfactory manner. Furthermore, the water so obtained needs no treatment whatever.

It was the Germans who built up the port of Tsingtao and provided water supply for it. In 1901, the Germans discarded hundreds of unwholesome wells which they had originally sunk and built the first pumping plant at the mouth of the Hai-po River, just outside of the north boundary of the city. The pumping engines were compactly encased in thick concrete walls and slabs reinforced with steel girders. One who visited the place without previous knowledge would believe it to be one of the many fortifications—in fact it is, structurally.

There are fourteen wells with 14-in. delivery pipe (see chart route No. 1) 4,561 metres in length (2.82 miles), and the water is pumped up to the observatory hill reservoir first by two sets of gasoline engine pumps and later on by electrically operated pumps. The capacity of this equipment is about 600 cubic metres per day. The catchment area is 4.16 square miles. This station is no longer used except when called on for some emergency supply.



Map of Tsingtao Waterworks

In the course of the increasing demand due to the growth of the town, additional supply was provided from a source at Jen Chia Shan near the Li-Tsun River about seven miles from Tsingtao. Its catchment area covers 41.65 square miles—ten times that of Hai-po station. The so-called Li-Tsun station was open to service in 1908.

At the Li-Tsun station, the Germans started with 18 wells, while the Japanese increased the total number to 48. The delivery pipe-line (route No. 2, chart 1) has a diameter of 16-in. and is 11,325 metres in length to the reservoir hill. There is a new pipe-line (route No. 4) of about the same length (11,297 meters), completed in August 1922. This new duplicate line is connected to route No. 3 in the Pei Sha River station line just north of Li-Tsun station so as to increase the quantity of water to be delivered as well as to constitute a safeguard against any accidents that may occur at the Li-Tsun station or its pipe-line, route No. 2.

In November 1914, the Japanese took over Tsingtao from the Germans. The increasing population demanded additional supply and 30 wells were added to the Li-Tsun station, giving a daily yield of approximately 7,000 metric tons of water.

Since 1914, the population has become more than double the pre-war figure (124,900 in 1921 against 58,260 in 1914); so a new pumping plant was installed on the bank of the Pei Sha River near Hsien Chia Che village. The delivery pipe connecting this and the Li-Tsun station is designated as route No. 3. It has a length of 10,700 metres. Here 27 wells arranged in a single row were spaced 20 metres centre to centre and these intercept water from a catchment area of 83.3 square miles, just double that of Li-Tsun; however, the total yield is about the same in those two stations.

Pipe Line and Wells

The following table gives total length of pipe, including delivery pipes, water mains, and laterals, laid in different years :—

Year	1914	1916
length, metres	87,836.78	92,669.00
Year	1917	1918
length, metres	91,159.76	98,902.56
Year	1919	1920
length, metres	105,535.46	127,074.66
Year	1921	1922
length, metres	132,323.56	148,474.00

Macadam roads 4 metres wide and special underground telephone lines are laid above the pipe lines.

In all these stations the design of the tubular well casings is unique. The casing is 150 mm. (6-in.) in diameter. The well screen consists of a single piece of seamless brass tubing perforated by 2 x 20 mm. vertical slits. There are 9,100 slits in the 10 feet effective depth with 20 inches of tubing, unslit at the bottom, thus providing for deposits of sand and silt. Each casing is sunk into the ground or river bottom about 40-ft. deep and above each a 2-in. pipe 3 feet in length stands out to show the location of the well. The place is thickly wooded, preventing possible surface pollution.

The water from infiltration wells flows into the collecting well of 5 metres diameter and 11 metres depth whenever the ground water table is at a higher level than the siphon pipe ; at other times

a vacuum pump is operated to ensure flow. The maximum yield of each well is about 250 cubic metres.

Reservoirs

From the collecting well, the water is pumped up to reservoir hill at an elevation of 68 metres above sea level. The two distribution reservoirs are of 2.000 and 4,000 metric tons capacity. The former is a German structure, the latter, Japanese.

There is one storage reservoir of 400 tons capacity on the observatory hill. This, owing to its higher elevation, is kept exclusively for the use of the observatory. The water is directly sent up from the pumping station by shutting off the reservoir hill entrance once every three months. There is also one 400 tons distributing reservoir at Tsangkew.

The reservoir of 4,000 tons capacity is built of reinforced concrete, 170-ft. by 80-ft. by 12-ft. 7-in. deep. The effective depth is 11-ft. 6-in. It is of the covered type with 66 pillars 1-ft. 5-in. square. The walls are 3-ft. 5-in. thick at top and 7-ft. 6-in. at bottom and the floor slab is 6-in. in thickness. The back filling is 3-ft. 5-in.

Consumption and Water Rates

In comparing the population and total consumption curves it is very clearly seen that the increase in consumption has gone on at a faster rate than the increase in population. The monthly curve shows seasonal variation in consumption. It shows high consumption during July, August, and September and low demand in December, January, and February of each year.

If we study the population curve with reference to that of average daily consumption, we find that the consumption per capita per day varies from 35 liters (9g.) to 80 liters, and this is largely due to four causes. First, the people are using modern toilet facilities in their houses and use water extravagantly. Secondly, the Japanese civil service men's families received special terms (e.g., Y.2.70 for a family with Y.450 salary ; Y.1.00, for Y.200 ; Y.0.80, for Y.150 and below ; Y.0.50, for Y.100 and below ; Y.0.45, for common employees) and consequently they were careless about keeping the taps closed. This has been shown by statistics to account for 45 per cent. of the annual total. Thirdly, there may be enormous leakage overlooked. Lastly, the Japanese probably consume more water per capita per day than the Chinese.

The water rate is on a sliding scale basis : for 100 cubic metres or less it is 15 cents per cubic metre ; over one hundred, 12 cents ; above 1,000, 6 cents. The supply for ships costs 5 cents per cubic metre. For sprinkling streets sea water is used.

The total investment is Y.3,318,666—42 per cent., credited to the Germans and 58 per cent., to the Japanese. The annual income in 1921 was Y.308, 436.10, and the maintenance disbursement amounted to Y.203, 091.80, with a net income of Y.105,344.30.

Since last July, the daily consumption has run around eleven thousand metric tons. According to the waterworks census of April 1922, 130,611 people were supplied. The consumption per capita per day was 83 liters (22 gallons), a comparative high figure for this city.

Should the normal condition of the port be maintained, a greater Tsingtao is bound to be built up in the near future. Enormous amounts of public lands have been leased out in the last two years and subdivided into street lots, especially in the Tai-Si section and in the manufacturing districts of Hsiaopautao, Szefang, and Tsangkew. In the Tai-Si section alone, 25,000 people could find homes or business quarters if all lots were occupied. The writer has much confidence in predicting a population of 180,000 in 1927, or 200,000 in 1929 for greater Tsingtao.

At 22 gallons per capita, the daily consumption in 1927 would be four million gallons or 15,200 cubic metres, which is the maximum capacity of the present works. After a careful study of conditions and consideration of data collected, the writer ventures to draw the conclusion that unless new extensions be constructed either by sinking more wells at Pei Sha River station or elsewhere, the people of Tsingtao will be conpelled to do without the supply in the night time or must be instructed not to bathe too frequently in the summer months. There may be much to say about the extravagant use of water, especially by civil service men and offices, leakages, and other causes of waste due to inefficiency of management ; but any improvement in these matters will not solve the problem of meeting the demand by the present supply five years from now.

Furthermore, a city should have a distribution reservoir capacity of 2 or 3 days supply if possible. On September 2, 1922, the consumption ran up to 13,094 cubic metres. The present capacity (6,000 cubic metres) could only meet 13 hours demand upon the basis of average daily consumption.

If a fire stream discharge one cubic metre per minute, only 6 streams could be operated at one time for 6 hours with September 2 consumption rate. We have few other sources of water supply in case of accident to the Li-Tsun or the Pei Sha River stations. Such failure means cutting down our present supply nearly one half. The reservoirs are too small to make up such deficiencies even for the very near future. It is therefore recommended that the present unit be doubled by constructing more distributing reservoirs, preferably at a lower elevation.

A New Laboratory

Here in Tsingtao, we are enjoying all modern conveniences, such as good roads, a modern sewage system, and natural potable water. From past records we find that the water is of normal hardness (about 50 p.p.m.), such as we usually expect from unpolluted ground water, wells, and filter galleries. Chlorine is a little too high, but this may be due to the location on the sea coast.

Since last year the water has not been well taken care of, and at present there is no laboratory to do the analysing. And it is not satisfactory to have a laboratory, which requires the direction of a sanitary engineer, entrusted to a hospital as the Japanese did in the previous years. The writer recommends a new independent small sanitary engineering laboratory, free from politics. He has drawn up a detailed estimate and complete list of apparatus required, but when his plan can be realized, no one can tell.

Physical, Chemical, and Bacteriological Analyses

(Tsingtao Water Works)

	1915	1916	1917	1918	1919	1920	1921
Color	nil	nil	nil	nil	nil	nil	nil
Odor	nil	—	—	—	—	—	—
Solid suspended matter p.p.m.*	236.5	167.4	204.0	214.3	209.0	200.9	168.4
Hardness, German degrees†	7.07	6.70	7.20	3.80	2.98	3.03	2.77
Chlorine, p.p.m.	68.5	64.7	65.66	50.54	59.29	59.60	49.20
Oxygen consumed, p.p.m. ...	1.2	1.4	1.2	0.92	0.96	0.90	0.82
Nitrogen p.p.m. :							
As ammonia	nil	—	—	—	—	—	Trace
As nitrites	nil	—	—	—	—	—	Trace
As nitrates	nil	Trace	Trace	—	—	Trace	Trace
Bacteria, per c.c.	—	—	155	143	112	102	81

*p.p.m. signifies parts per million or miligrams per liter.

†Hardness in German degrees designate parts of CaO in 100,000. To convert into p.p.m. of CaCO multiply by 17.8

New Concrete Block Machine

THE latest invention in the line of concrete machinery is the Wert Process, a machine which will manufacture concrete bricks of any color desired, face up, on a wooden pallet.

The facing or composition is a patented article combined with the Portland cement and making them absolutely waterproof. The bricks are manufactured on a wet process, 1⅓ yards sand and 7 sacks cement manufacture 1,000 bricks. The machine will manufacture plain, faced or tapestry brick without any changes.

Extend Acid Industry

Demand for sulphuric acid expanding rapidly beyond 20,000,000 pounds a month, Japanese sulphuric acid manufacturers who have been worried by bad prospects are now delighted. Some who left lead chambers idle are repairing them while others are erecting new ones. This change for the better is especially pronounced in Osaka. The Osaka Metal Smelting company has just erected a new lead chamber. The Ito Sulphuric Acid and Soda company has installed two additional condensing furnaces.

Other fertilizer or chemical companies have repaired their idle plants and soon the demand for 65 per cent. acid will be met. No step has been taken yet for increasing production of strong acid. Demand for 66 per cent. is only half met at present. With this in view the Osaka Alkali Works have installed two more condensing furnaces. The Rhasa Island Phosphate company is stated to be installing one. The Nankai Bleaching Powder company has had two furnaces idle, which the company will repair and put in blast again soon.

Mukden Tram Scheme Held Up

Gov. Wang Yung-kiang, of Fengtien, has demanded of Japanese Consul-General Funatsu, Mukden, the abolition of the Mukden Horse Car Co. under Sino-Japanese management. This demand is grounded on the expiry of the term, but it is suspected to be connected somehow with the new Mukden tramway scheme. An understanding was entered into some time ago between Governor Wang and the Okura Company, to construct an electric tram system for Mukden under Sino-Japanese joint management. The Chinese now seem desirous of operating the trams on their own account.

The South Manchuria Railway Co., in view of the negotiations between the Chinese and the Okura's for the conversion of the horse tram to an electric tram system, has held off from laying an electric tram in the railway town and now the joint management scheme is stoutly opposed by the Chinese municipal administration and the governor. Officials of the Railway Company do not favor constructing a tramway for the railway town alone, for great inconvenience will be met with in connecting it with the Chinese system, that is bound to be established in the city of Mukden. In the second place, even the current expense of such a project is not likely to be repaid, aside from the redemption of the investments on capital account. The plan may have to be abandoned owing to lack of co-operation and open opposition by the Chinese.

To Probe Sungari Conditions

The ministry of communications has dispatched Mr. John E. Baker, an American, who has served as adviser to the ministry for many years, to proceed to Harbin to investigate the conditions of navigation of the Sungari River. Mr. Baker is also instructed to look into the railway conditions in the three eastern provinces.

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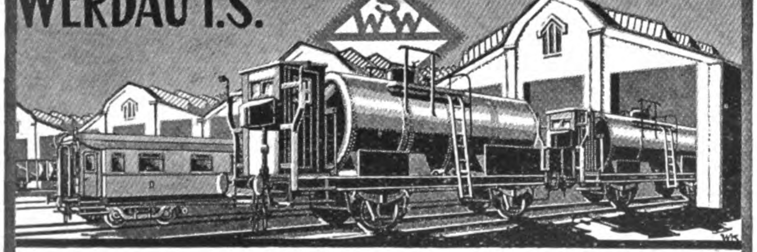

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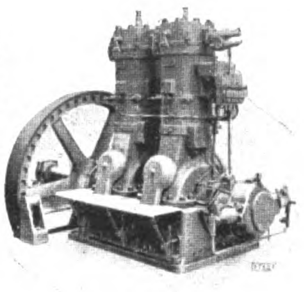

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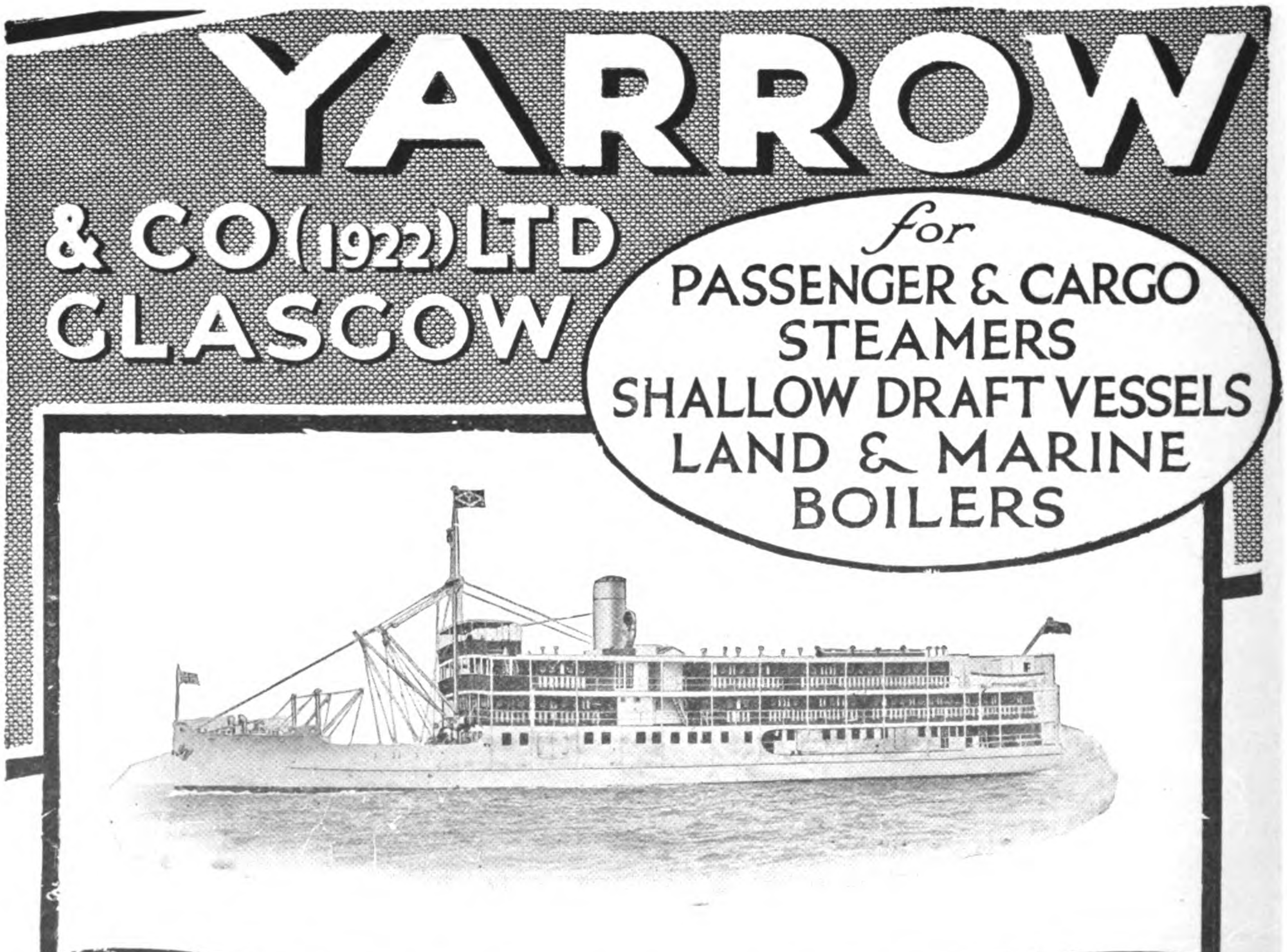

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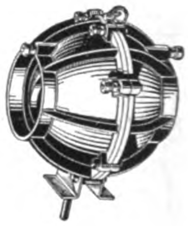

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ENGINEERING FINANCE COMMERCE

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Build China's Railways

A Practical Use for the Boxer Indemnity

The Safety of Foreign Lives and Properties in China, Success of International Co-operation and the Sanctity of Treaties Rests Squarely on Faithful Observance of the Terms of the Boxer Protocol

Violation, repudiation and the shirking of international agreements and obligations is becoming such a commonplace that almost any powerful government can desert its associates with impunity. The world perhaps is moving towards the goal of universal peace through the creation of a league of nations or a world court, implying a willingness on the part of members to abide by its decisions and carry out their obligations. Can an international court or the council of the league compel obedience to its mandates if any one of the larger powers decides that its special interests can be better advanced by breaking away from its associates? Consider this question in its application to China. International intervention is again being urged as the solution to China's troubles. The purpose of this article is to prove that such a remedy cannot be applied with any assurance of success except when it is preceded by an irrevocable and solemn understanding between all the powers to stand with each other and share equally all responsibility until China is once more able to fulfill her treaty obligations.

It is pertinent and timely to ask the question: What is the sum total of the claims now filed with the foreign legations in Peking, representing the cash value of foreign lives, damages to properties and losses incidental to illegal taxation, interference with trade and treaty rights and other injuries not included under the head of defaults of interest and principal on loans or failure to pay commercial obligations? It is not too much to state that at the present moment when the powers are devising methods to release China from the Boxer indemnity that claims totalling Taels 100,000,000 have piled up in the various legations, and with no prospect of ever being paid.

THE controversy over the best way to spend the unpaid portion of the Boxer indemnity for the benefit of China raises a point of international law whose proper settlement is imperative for the future success of international co-operative movements and calls for the immediate convocation of a conference of those powers whose joint military action and diplomatic pressure brought China to her senses in 1900. Full and loyal co-operation between all foreign powers was the only weapon which saved the legations and forced the Manchu rulers to accept the joint note of December 22, 1900 with its demand for a lump sum indemnity as compensation for the loss of lives and damages to foreign properties during the Boxer outbreak. The note was signed by the representatives of Germany, Austria-Hungary, Belgium, Spain, United States of America, France, Great Britain, Italy, Japan, Netherlands and Russia and compromised each signatory to stand with its associates in exacting compliance with the indemnity terms until fully carried out.

In the Protocol, the Chinese government agreed to pay the lump sum indemnity of Taels 450,000,000 as stipulated by the powers in their joint demands. A subsequent protocol signed on June 14, 1902 and to which China was not a party, apportioned this lump sum amongst the powers according to their estimates of damages. As far as China is concerned her obligations are to all the powers—not to any one signatory. The protocol recognizes no individual indebtedness, therefore any modification of its terms or remission of the amount apportioned to any one power would seem to be a matter which concerns exclusively those powers who signed the protocol of apportionment. The withdrawal of any one power from the international concert by negotiating direct with China not only impairs and invalidates the main treaty but makes extremely difficult that harmony and accord essential in carrying out other international undertakings.

We find, however, upon final adjudication of its claims, the American government found that they totalled less than the amount of the indemnity apportioned to it and in May, 1908, the bond received from China amounting to $24,440,778.81 was reduced by congress to $13,651,492.69 and the president was authorized to remit this to China as an act of friendship. In acting on its own initiative and without consultation with its associates, the action of the American government no matter how otherwise justified, would seem to be contrary to the spirit of the joint note of December 22, 1900 under whose "irrevocable" provisions the payment of the total indemnity by China was made possible.

America is therefore placed in the position of being the first to break away from its international committments and in so doing furnished a precedent that has been taken advantage of by China and other powers to destroy the efficacy of the instrument designed to inspire respect for foreigners and their rights in this country. The German and Austrian portions of the indemnity were wiped out as a result of China's participation in the war on the side of the allies. Russia has voluntarily surrendered her claims; France will employ her portion for guaranteeing the obligations of the Banque Industrielle de Chine, Great Britain and Japan are formulating

plans to employ their shares in cultural and other propaganda, so it may be said that international solidarity for the protection of foreign rights in China has practically disappeared.

With the larger powers shirking their responsibilities under the protocol, what chance has Belgium, Spain, Italy and the Netherlands for collecting the balance due them ? These smaller nations will be penalized in order that their stronger partners may derive special benefits from China at their expense. Such a conception of international co-operation will help to understand why it is now so difficult to bring about united action in the diplomatic corps at Peking.

At a time when international co-operation is most essential to the peace of the Far East and the proper development of China, anything which tends to weaken such united action should receive serious consideration, especially by America who now stands as the champion of international co-operation after withdrawing from the most vital undertaking entered into jointly by the powers for safeguarding foreign interests in this country. If the larger powers are to follow the lead of America and remit their share of the Boxer indemnity for special purposes, it is a matter which deeply concerns the smaller powers, one which properly should be made the subject of an international conference in which the United States could have no voice unless its government recognizes and admits its responsibilities under the original agreement and withdraws its right to act independently. China has no right to participate in such a conference. She can accept or reject whatever plan is agreed upon, but the chances are that any proposition which relieves her of the payment of the indemnity and at the same time conduces to her own benefit will be cordially received.

It is a significant fact that the protocol powers are now standing solidly together in refusing the request of the Chinese government to turn the old Russian legation over to the Soviet. The point involved goes squarely back to the demands submitted to China in the joint note of December 22, 1900 and the protocol which placed the entire legation quarter under foreign jurisdiction or extraterritoriality, an obligation on the part of China to *all* the powers from which no one power could recede and undermine or destroy the rights of the others. Now that the Soviet government of Russia has surrendered its extraterritorial rights under the new treaty with China carrying with it the extension of the principle into the Russian compound in the legation quarter, we find that the other protocol powers insist upon joint control over the property as part and parcel of the original deed of cession granted under the joint demands.

In plain words, the present attitude of the powers fully supports our contention. If the rule of solidarity is applied in order to preserve intact one clause of the protocol, it must also extend to any independent remission of an indemnity which as a lump sum was conceded by China to satisfy the joint claims and afterwards apportioned between the powers according to their own estimates of damages. If no one power can now impair the rights surrendered by China to joint jurisdiction over the legation quarter, no one power should be permitted to vitiate that clause of the protocol which acknowledges a lump sum idemnity. The obligations in both cases are identical.

The principle is the same as though one of the allies in the late war should now experience a change of heart and in order to advance its special trade or other interests with the central powers, suddenly discovers that its claims for reparations were grossly exaggerated and surrenders its claims and rejects any responsibility for the collection of the amount due to its allies. There is absolutely no difference in principle between such procedure and the action of the powers in breaking away from their committments under the Boxer protocol.

An international conference of the indemnity powers should now be called. The danger to Chinese nationalism through the propagation of conflicting ideas of education, culture and politics should be recognized and some utilitarian program agreed upon that will bring the greatest good to the greatest number. An international agreement providing for the expenditure of the Boxer indemnity balance for new railway construction under the supervision of a technical head appointed by the powers concerned, would materially help to straighten out the complicated railway tangle and pave the way for a wider application of the principle of foreign supervision over loan built lines.

Although the United States is now the principal advocate of international co-operation in China, there is no telling when our government will again denounce entangling alliances. American policy in this respect has been as unstable as water, the other powers never knowing what we would do next. Our failure to work in harness has since been emphasized in the senate's rejection of the Versailles treaty which abandoned our allies to work out their salvation in their own way and plunged Europe into a financial chaos which will take many weary years to straighten out. All this has a most important bearing on the present tendency to bring about further intervention in the affairs of China.

The American and British chambers of commerce of Shanghai, the American association of China and the China society are a unit in demanding firm co-operation between the powers in order to counter the ignoring of treaties, imposition of illegal taxation, outrages upon foreigners, banditry, piracy and other evidences of unchecked lawlessness that have many points of similarity with conditions leading up to the former catastrophe which compelled the powers to act in unison for the defense of foreign lives and property. Behind the shadowy pretense maintained in Peking by the war-lords to stave off the demands of foreign governments, defiance of the treaties is practised with impunity and the menace to foreign lives grows daily more alarming. It is this very impunity from chastisement and the payment of indemnities which encourages the war-lords to continue to flout the treaties and stand together as one man in defense of any of the bandit oligarchy who resort to Boxer methods in showing contempt for the foreigner.

Is international intervention the remedy for this state of affairs ? Granted that the business-men of Shanghai are right, what guarantee has a coalition of powers that one of the partners will not break away from any new pact, repudiate its share of the responsibilities and reinstate itself in the good graces of the Chinese at the expense of the others ?

There is no use shutting our eyes to essential facts. The record of murders, outrages, piracies, and other high crimes against foreigners these past few years will call for another huge lump sum indemnity and this can only be extracted from China in the same manner as the Boxer damages—by the concerted and firm action of all powers. It is not too much to state that the total of these new claims for damages will exceed Taels 100,000,000. Yet with this truth before us, we are witnessing a wild scramble on the part of these very same powers to release China from the indemnity imposed upon her in 1900. We have listened intently, but have heard no voice in high places advocating the employment of the Boxer funds to satisfy these new claims for damages. The powers fully understand that China is bankrupt, that even the expenses of gov rnment at Peking are unpaid, yet the claims for new damages against foreign lives and properties keep mounting up higher and higher with no possibility of their being paid for another generation. By that time or probably long before, another frenzy of repentence will be started by the missionary element and the score again wiped out.

It is useless therefore for foreigners to call loudly for concerted action between the governments for the protection of their treaty rights unless such action be preceded by an iron-clad and irrevocable understanding that no single power will recant or repent and double-cross its associates by releasing China from the penalties imposed in order to further its own special ends in this country. If such a program could be entered into and faithfully carried out, concerted intervention would probably clear the atmosphere and usher in a new era in the Far East. If it cannot be agreed upon, foreigners may as well forget about it and settle down to make the best of a bad situation.

It would seem that if the United States hopes to attain cordial co-operation with other powers in the reconstruction of China she would do well to reconsider her stand on the Boxer indemnity and join with her protocol partners in a new conference based on the terms of that instrument in order to determine the best method of releasing China from the indemnity obligations imposed upon her through concerted action. As far as we see, there could be no objection on the part of the United States if at this time the other indemnity powers come to an understanding for the utilization of the unpaid balance of their share of the indemnity for railway purposes, and as a guarantee that the agreement will be lived up to faithfully by China, impose the employment of another foreign adviser with the rank of inspector-general of indemnity railways which may lead in the future to the application of similar supervison over the other European loan-built railways on which the principal and interest is being defaulted.

This phase of the question is one which Americans may not lightly ignore. America stands before the world as the champion of international co-operation in China, the leader of the new consortium in which is pooled practically all the outstanding agreements for the financing and construction of new railways in this country. Some day the consortium will be prepared to function and its greatest difficulty will be found in inducing the Chinese to accept its ideas of supervision over the expenditure of the loans and the direction of the railways when completed. These guarantees the Chinese will not be disposed to give, so any international program which will pave the way for the proper investment of foreign money for railway purposes should merit serious study. Once the Chinese are convinced that such guarantees will not be employed to further impair their administrative independence and that supervision is essential if the country is to be developed with foreign loans, they will look with a greater sympathy on the viewpoint of the consortium.

The application of the combined Boxer indemnity funds to some such program under the direction of a foreign inspector-general would do more towards convincing the Chinese of the necessity of such supervision than anything else. It can be done. China is in no position to reject such an offer and the United States, as leader of the consortium, should take the initiative by reconsidering the manner in which she has broken away from her indemnity partners and join with them in a constructive program upon which, to a large extent, will depend the success of the consortium, and our diplomatic prestige in China.

America expects other powers to live up to the joint obligations imposed upon them through the consortium and the four-power and nine-power treaties. In these matters, faithful adherance to the principles involved are calculated to preserve American ideas of what is best for themselves and for China. Other powers are, however, more interested in the material development of China than in her cultural and educational progress. America has broken away from her associates to advance her special cultural interests at their expense. The time has arrived when there should be a coming together on these matters and if America expects cordial and loyal co-operation, there should be some reciprocity, some sacrifice of our ideals for the benefit of our associates. This article shows a practical way out, one that can be applied with advantage to all. At the rate we are going, the present generation will be dead and forgotten by the time the consortium is ready to function. In the meantime, China rots and decays for lack of transportation facilities, while foreign firms are being forced one by one to the wall through China's inability to pay her obligations. Education, sanitation, cultural and spiritual uplift will not solve the problem. Loans to China at this time are out of the question. Colleges will not build railways but railways will build colleges. Let the Boxer indemnity do the work.

G. B. R.

* * *

Why Waste the Boxer Indemnity on Education?

Build Railways and Provide Employment for the Masses

(CONTRIBUTED)

IT is now five years since the consortium was organized to finance China and its attitude remains uncompromising in regard to loan terms. China harbors the delusion that her undeveloped resources conceal the world's last Eldorado and with her credit ruined, dreams of borrowing money for railway construction on the old unrestricted Pukow terms. In the meantime, she is trying to advance along her own lines. Education has made great strides ; the clerical classes are rapidly increasing and the professions are crowded out of all proportion to the demand. There are three government colleges devoted to the education of civil and mechanical engineers, railway traffic officers and employees of other government services. From these institutions graduate at least one hundred engineers annually and a still larger number of embryo traffic officials, all relying upon the government to furnish them employment. In addition, there are the returned American students to be provided for. The government does its best to meet these expectations and the effect of its philanthrophy is well illustrated in the enormous increase in railway personnel since 1916. The following table is illuminating :—

Year	Kilometres worked	Personnel	Trains per day
1916	7,049	59,857	11
1919	7,183	73,651	11
1922	6,279	91,356	12

It is seen that in 1922 with less mileage operated than in 1916 and with only a slight increase in traffic, the number of railway employees has almost doubled. Here we have the logical consequences to the Chinese system of dual control which breeds nepotism of the worst kind and to the weak handling of the bolshevist labor agitation (arising in large part from an over production of college educated employees) which culminated in the disturbances of October 1922. Since the abolition of the old classical examinations in 1904 the student problem has been a nightmare to the Chinese government. The examinations were revived in 1906 but the successful candidates were never employed by the government. Yuan Shih-kai saw in the student class a dangerous political element and found employment for a selected few in order to bind them to his cause. These men have been willing recruits to the various militarist factions which have grasped the reins of government during recent years. The student class throughout the country has developed into an element of unrest, instigators of agitations against foreigners and meddlers in international relations. Their record is one of childish intervention in politics, of college and school strikes and disobedience to their tutors. The government has always temporized before this insubordination and applied local solutions when the problems became acute. Yet in the face of this record the foreign powers now propose, though the use of the Boxer indemnity for educational purposes, to add to the embarrassment of the Chinese government by reinforcing an element already far in excess of national requirements.

To those at all conversant with the condition of the Chinese government services this can only appear as a futile waste of money. The only way to put the Boxer indemnity to useful purposes is to create employment, not only for the technical graduates but for the masses, by allocating the annual interest on the total of the fund to the construction of new railways in accordance with a fixed program supervised by a technical adviser appointed by the powers concerned. According to official returns the Boxer indemnity in January 1920 was apportioned as follows, calculating the French, Italian and Belgian portions at 25 francs to the pound sterling and omitting the minor claimants :—

Great Britain	£11,180,000
France	17,650,000
Italy	5,920,000
Russia	30,760,000
Japan	7,530,000
Belgium..	1,870,000
Total	£74,910,000

Deducting Russia's share and disregarding amortization, there remains the annual interest at four per cent. on £44,150,000 to devote to railway construction, or £1,766,000 equivalent to approximately $14,000,000 silver. Unquestionably, the most urgent railway project is the completion of the Canton-Hankow line, upon which depends the unification of North and South and the development of Canton. For similar pacification purposes and the elimination of the Yangtze above the gorges as a highway of trade, the construction of the Hankow-Szechuan railway is next in importance. These two projects should have the first claim on the remitted Boxer indemnity. With 60-lb. rails at the current price of $100 (silver) a ton ; bridges and culvert openings totalling 90 feet per mile and embankments and cuttings averaging ten feet in height or depth, the present day costs of railway construction in China is $75,000 per mile, exclusive of rolling stock, or, $85,000 per mile fully equipped. The heaviest work would increase the cost to $100,000. The annual interest on the total of the Boxer indemnity could therefore construct a minimum of 140 miles of line a year or a maximum of 180.

Such a program would provide employment for thousands of workers, bring incalculable benefit to Chinese and foreign trade and infuse new life into the railway service now suffering from stagnation and overcrowding. The indemnity powers should insist on the faithful execution of the yearly program and extract guarantees that the revenues from the lines so constructed are allocated for new equipment or additional construction. Under such a program

supported by all the interested powers a foreign railway expert could be appointed to supervise the " indemnity " railways who would rank in importance with the inspector-general of customs and the head of the salt gabelle.

It is to be hoped that this vast sum of money will not be wasted at this time on superfluous and unwanted education but expended under some common agreement between the indemnity powers for the creation of public utility works like railways that will confer material benefits on Chinese and foreign trade, provide employment for the host of technical graduates and an army of workers and contribute towards the pacification and unification of the nation by linking the north with the south and the east with the west in bonds of a common understanding. The present system under which each indemnity power seeks to gain some particular advantage through the employment of their portion of the remitted Boxer funds for special purposes only tends to perpetuate international discord by recreating spheres of influence disguised under an altruistic mask. The consortium was organized in order to supplant international competition in the development of China by international co-operation in furnishing the funds, and because of the chaotic conditions and absence of guarantees and security for such loans, nothing has been done to carry out its program. Political spheres of interest were eliminated under the terms of the consortium agreement and made impossible of resurrection by the provisions of the nine-power treaty signed at the Washington conference. Political spheres, however, are being superseded by a more insidious system of peaceful penetration under the guise of philanthrophy. America is silently pushing ahead her plans to dominate the educational and spiritual sphere by spreading her ideals and doctrines amongst a people wholly unfitted to assimilate them, breeding discontent and agitation which in the end will defeat the more practical plans of other nations who entertain no illusions about the capacity of the Asiatic to absorb western ideals.

The success attending the American program has provided the precedent for other powers to protect their interests in China along similar lines and as a consequence we find the British, French and Japanese governments devising plans for the expenditure of their share of the Boxer indemnity that will counteract in part the Americanization of the young Chinese mind. The logical outcome of this tendency will be to partition China into several cultural spheres permeated with ideals so conflicting that pacification and political unification under Chinese standards will become impossible. If the American example is followed by the other powers, international conflict for control of China will be perpetuated, only instead of actual armed strife between the powers, the brunt of the fight will be borne by their spiritual converts and partisans striving to graft their conception of foreign ideals on to the Chinese body-politic. If the Chinese are to work out their own destiny they should be permitted to follow their own conception of ethics, culture and government, in which the west can teach them little that is superior to their own. Herein lies the fallacy and weak point of the American program and if followed by other powers in pursuit of their own special ends, can only retard the political development of this country and invite a continuation of the unrest into which the country has already been plunged by attempting to digest too rapidly a political salad mixed from the many recipes supposedly adapted to Chinese taste from a confusion of foreign menus.

* * *

America's First Obligation in China

Build the Szechuan Railway

Further Thoughts on the Boxer Indemnity

In order that Americans may get a common-sense perspective on this much discussed Boxer indemnity question, we must commence by asking ourselves the questions: What are we here for in China ? Are we here as traders or are we here as philanthropists ? On the proper answer to these questions rests not only the efficacy of our policies and future prospects in this country but the right to ask other powers to co-operate with us in carrying out Far Eastern treaties.

Now we are told by our statesmen, by our orators, by our captains of industry and by our strategists that our chief concern in China is the maintenance of the "open door" doctrine, guaranteeing to Americans the unimpaired right to equal trade opportunity. In every instance where our government has taken a decided stand on Chinese questions it has been in some way connected with our conception of the "open door" principle, and whenever our jingoes and greater-navy advocates seek convincing arguments for the purpose of prying loose an increased appropriation from congress, they invariably harp on the urgent necessity of defending the "open door" doctrine in China. Now it is a fair statement that American trade in this country has grown to its present proportions, not through any particular efforts of our own, but as the direct result of the investment of European capital in the development of its railways and other industries. Americans have done little but talk about what they are going to do some day in the future, at the same time placing obstacles in the way of others doing anything that might in some remote way deprive them of equal opportunity whenever in their judgement the time is opportune to exercise that right.

In our opinion, if the United States has contracted any obligation in China, it consists in a duty to resolve its high principles into some practical program that will contribute towards the further growth of a trade which to date has been made possible largely through the initiative of others. We do not wish to be placed in the position of opposing education or of belittling the meritorious work of our missionaries and educators. They have their own organs and champions who make themselves heard at every opportunity and are able through a perfect organization to bring pressure to bear on Washington which no politican dares to ignore. THE FAR EASTERN REVIEW is here to advance American trade interests, but for the past twenty years we have witnessed the gradual side-tracking of national commercial activities until to-day the principal American business in China is the distribution of charity. The time has arrived when our trade interests are entitled to more consideration. It is the duty of our government to devise some practical program that will enhance our commercial prestige in China through the investment of capital in productive enterprises.

The United States has assumed certain definite development obligations in this country which completely overshadow its humanitarian duties. We received in 1903 a promise from Prince Ching that in the event foreign capital became necessary to build the railway from Hankow into Szechuan, American and British capital would be given the preference. In 1905, the British, French and Belgian groups interested in this concession, pooled their activities and invited the Americans to join. We declined. Four years later when this same combination was ready to sign a contract for the construction of the Hukwang railways, which included the line into Szechuan, we demanded admission into the group and President Taft went so far as to send a friendly ultimatum to the prince regent to obtain participation for American capital.

Again, in 1916, the Siems-Carey Company signed a railway contract with the Chinese government which conflicted with rights previously ceded to other powers and after two years of surveying finally located a line into Szechuan, only to have it protested by the British. The point we desire to emphasize is that Americans are now morally committed to build a railway into Szechuan, an obligation imposed upon us as the outcome of two strenuous diplomatic fights to uphold our conception of the "open door." We forced the door open but never walked through to see what was on the other side. We contend that this obligation transcends in importance any other claim on our finances and we believe that the American government would be wise to take steps to make good its policies through a practical program that will at least equal in part the labors of other nations in developing the resources of China.

It is for this very practical reason that we invite attention to the hokum and buncombe concealed in a program which ignores common sense and violates elementary economics. In this matter of the Boxer indemnity and its contingent features, congress assented to economic principles that if applied by its members to their own affairs would land them in the poor house. We would like to hear the classic roar of the watch-dog of the budget when he awakes to the fact that someone slipped over a philanthropic deal on congress which costs the nation twice as much as the amount given away.

Let us see how this works out. We release China from an *irrevocable* penalty imposed upon her for the murders, violations, outrages and other indignities inflicted upon our nationals in 1900 and hypnotize ourselves into the belief that we are in some sort of fashion, saviors of China. We invite the other treaty powers to a good, old-fashioned Methodist revival meeting at Washington and

under the hysteria of repentence promise to undo our collective mistakes and henceforth respect China's sovereignty by the abolition of extra-territoriality. We then calmly forget all this flubdub and vote an appropriation of over four million good American gold dollars to construct six gunboats to patrol the rivers and inland waters of China in order to assure protection for American lives and properties against the fury of mobs, bandits, pirates and disorderly soldiery. The picture is enlightening. Here are all the treaty powers lined up, solemnly compromised to surrender their extra-territorial rights in this country, while congress with one hand votes for the remission of an indemnity imposed as a penalty for previous outrages upon American citizens and on the other hand votes a greater amount from the treasury to provide a guarantee that these outrages will not be repeated! Viewed from this angle the remission of the Boxer indemnity for educational purposes at a time when the American people are called upon to pay out a greater sum in order to protect American lives and shipping in China, is as much a grab from the American treasury as though some congressman dipped his paw into the pork barrel when " H & M " Dawes was not looking and drew out a ten million dollar appropriation for a federal building in Squeedunk or a river and harbor improvement for Olapaloosa creek.

We can expect that in five, or ten years at the outside, foreign extraterritorial rights in China will be considerably impaired, if not altogether abolished, and the right to navigate China's inland waters will be denied to foreign vessels. In ten years, the cost of six Yangtze River gunboats and their maintenance will approximate $15,000,000 gold and by that time the railway into Szechuan will be operating and the Yangtze patrol sent to the scrap heap. In view of these facts, would it not be better economy for the American government to take its share of the Boxer indemnity amounting to $6,137,552 and add to it the cost of constructing and maintaining a Yangtze fleet and employ the fund in some manner to carry out the obligation it has incurred to build a railway into Szechuan? At a cost of $50,000 gold a mile, the $20,000,000 involved would build and equip some 400 miles of railway, eliminate the Yangtze gorges as an artery of transportation and open up an inland empire to world trade. There will be no need for gunboats on the upper Yangtze when the railway into Szechuan is built. This, it would seem, is real philanthrophy, common-sense economy and the highest kind of statesmanship. As it now stands, these $20,000,000 will be wasted on an education entirely unsuited to the culture of the people and in maintaining a gunboat patrol to defend what at best is only a temporary shipping gamble that will disappear as soon as the railway is constructed.

One of the penalties imposed upon China for the Boxer outrages was the razing of the Taku and other ports impeding free communication with Peking and the right of the powers to occupy with their troops certain points that would assure the same object. This penalty was not enforced until 1912 when the revolutionary movement looked as though Peking might again be cut off from communication with the sea. An international force was then sent to guard the line of the railway from Peking to Shanhaikwan. The Boxer protocol, after creating the legation quarter, conceded to the powers the right to maintain permanent guards for its defense. These clauses are responsible for the presence of a small international army of occupation in North China with a detachment of marines acting as American legation guards and a regiment quartered at Tientsin to patrol our sector of the Peking-Mukden Railway. The cost of maintaining this American force in a foreign country with whom we are at peace, is part of the annual army and navy appropriation, but it cannot be less than $1,500,000 a year.

At a time when the principal powers are releasing China from the monetary penalties arising out of the Boxer troubles and committed to surrender their extra-territorial rights, it would seem that the first step as a token of good-faith should be the withdrawal of their armed forces. That this has not been done provides sufficient evidence that the legations lack faith in China's ability to protect them against any possible anti-foreign disturbance. The fear of another outbreak is always present. We do not trust China. We try to fool them by remitting the indemnity as a token of friendship but copper the bet by retaining sufficient troops on the spot to see that they remain friendly; the story of the Yangtze patrol applied to the army.

In the final protocol, provision was made for carrying out the Hai-ho and Whangpoo River conservancies. In the case of the latter the improvements have reached a stage where unless greater harbor facilities are now provided, the port of Shanghai will dwindle in importance and lose its position as the distributing point for central China. Further improvements depend largely upon an extension of the settlement that will include the new port project designed by an international commission of experts, but to date the Chinese authorities have evinced no interest in the scheme or any indication that it will ever be approved and carried out. Meanwhile the port of Shanghai with its immense foreign vested interests is menaced with decadence. It would seem that if Great Britain and the other maritime powers were anxious to protect the interests of their nationals in this port, that the remission of their share of the indemnity might have been made contingent upon China's acceptance of the Shanghai harbor scheme and extension of the settlement. As it is, by vitiating one clause in the " irrevocable " terms of the Boxer settlement, the powers concerned have surrendered the weapon which would have compelled compliance with another clause upon which their trade interests to such a large extent depend.

The diplomatic body at Peking is standing firm on the inviolability of the clause in the Boxer protocol which creates the legation quarter, the right to defend it and maintain open a road to the sea, yet their respective governments (with the exception of France) have signed the Washington treaties providing for the abolition of extra-territoriality and the annulation of all agreements which in any way impair China's sovereign rights. Germany, Austria and Russia have surrendered their extra-territorial privileges and there is reason to believe that the present Japanese cabinet is seriously considering the same step.

Will the abolition of extra-territoriality, when it comes, vitiate the clauses in the Boxer protocol which gives the powers exclusive jurisdiction over the legation quarter and the right to maintain guards for its defense? With three of the world powers outside the protocol combination and the possibility that Japan will break away in order to advance her own vital interests, a rather embarrassing situation will be created. With Germany, Austria, Russia and Japan willing to trust to the honor and ability of the Chinese government to protect their legations, how long can America, Great Britain, France and Italy hold out and maintain their armed forces in North China?

There are many angles to these questions which space does not permit us to take up. The whole problem bristles with difficulties and inconsistencies. The situation is unsettling to the peace of the Far East and menacing to the vital interests of every foreigner engaged in business in China. It is not a question of what concerns any one nation. It concerns us all.

If these changes are to come, why wait for the situation to be muddled and complicated through international jealousies and intrigues to gain special advantages? Why should not China herself invite attention to the dangers arising from this new "battle of concessions" disguised under the garb of friendship and benevolence and ask the protocol powers to a new conference in order to discuss these matters and seek some way in which her higher interests may be advanced by the friendly remission of the Boxer indemnity?

G. B. R.

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"Willard Straight"

The Combination of Idealism, Finance and Politics which Forced an International Financial Monopoly on China

An Important Contribution to Modern Far Eastern History

"Willard Straight" by Herbert Croly, published by The Macmillan Company

ASIDE from the irreparable loss to his family and friends it was a great pity that the promising career of Willard Straight was so abruptly terminated by his demise at a time when his accumulated knowledge of Far Eastern finance and politics would have proved of incalculable benefit to American activities in China. Straight was the only American in that small group of internation financiers who knew more about foreign policies concerning China than the frequently changing diplomatic representatives of their respective governments. We are told that an era of international co-operation has been ushered in by the consortium; that China's status has been permanently defined in the nine-power treaty, but in the event the consortium fails to function and the pooled rights and concessions revert to their original holders, the time may arrive when

Americans will have cause to regret the untimely death of one of the few experts of their nationality who could sit around the table with the financial diplomats of the other powers and talk their own language. It took a long time to perfect his education in these matters. Like most young enthusiasts his heart overruled his head. In time, however, intimate contact with the best financial and political intellects of other nations gave him a more enlightened insight into the realities of the game and before he died many of his earlier ideas had been displaced without sacrifice of his ideals, by a more mature and statesmanlike view point.

Straight possessed those rare qualities which endeared him to friends and won the admiration of his opponents. Enemies in the strict sense of the word, he had none. Had he lived, he would have assumed a leadership over American activities in China that would have welded together discordant elements for the better attainment of national ends. Although Straight's ideas were at times open to fair criticism, he came nearer to being the ideal leader of Americans in China than any of those who have since posed as such before their countrymen. He was fortunate in starting his career at a time when broad-minded Americans interested in Chinese finance and railway construction were willing to sacrifice, or at least side-track, their own plans in order to get behind him and support a national policy.

It is no detraction from Straight's achievements to state that only those few who had completed the preliminary work of organizing an independent American financial group to operate in China, can appreciate the bitter disappointment and heavy penalty imposed on them by being frozen out of the field through the formation of the official banking group with its monopoly of support from the state department. These men had their own plans for financing and constructing railways in China, yet they accepted gracefully their elimination and did nothing to embarrass or hamper the working of the official group in carrying out its conception of a national program. In fact, they at all times worked with it. In the light of subsequent events and the failure of all enterprises initiated by the official group, we have often thought that a fundamental mistake was made in limiting American activities in China to a favored monopoly. Had the field been thrown open to competition when America first began to take an interest in Chinese investments it is certain that many valuable concessions would have been financed with the result that America's vested interests would now equal those of other countries, instead of being confined to the paltry $7,500,000 participation in the Hukwang loan, for which we have nothing to show, not even in the supply of materials.

The fallacious idea that European financial groups enjoying a monopoly of support from their respective governments, were the instruments for carrying forward predatory designs upon China, was accepted as a reason why an official American group should be formed in order to defend China's integrity and give expression to our conception of the " open door " principle. There were excellent reasons, imperfectly understood even at this time, which fully justified France, England and Germany in extending a monopoly of diplomatic support to trusted national financial groups. It was the only safe and expeditious manner by which these governments could counter the political railway moves of the others. There was no good reason, however, for the extension of this principle to America, nor for the program initiated by the American group once it entered the field, at a time when it embraced many wonderful opportunities for advancing national interests through independent operations. Had the American group started in by carving out a sphere of its own (it had practically all of south and southwest China to work in without creating international complications) instead of deliberately seeking contracts and concessions which raised the issue of the " open door " at a time when America was in no position to give practical effect to its doctrine of equal opportunity, or, had independent financiers been permitted full liberty of action, greater headway would have been made. By confining our activities to a quixotic official monopoly which from the first was more interested in raising delicate international issues and fighting China's battles than in seeking legitimate opportunities for the investment of American capital, a fine opportunity was thrown away.

The operation of the official American program as so clearly described in Mr. Croly's life of Willard Straight was confined in the beginning to negotiations which far from being nationalistic in scope seemed to be concentrated in giving expression to the rather vindictive determination of Harriman to penalize Japan for failing to sell her rights to the South Manchuria Railway. Straight's attitude towards Japan was largely influenced through his failure to achieve this particular objective in the Chinchow-Aigun Railway contract and subsequent currency loan negotiations. The story of these intrigues is too long to review here, but it can be said that each step of the American group raised new questions and fresh complications whose only solution seemed to consist in expanding the official monopoly until the six big world powers had China firmly in their grasp.

There were, it is true, insuperable obstacles to the success of an independent American program in China which at that time were basic. It is rather a sad commentary on American diplomacy to learn that after creating a financial instrument with a monopoly of official support to combat the activities of European groups in China, it developed that American bankers were so dependent upon European money markets that they could not underwrite an important foreign loan without asking their opponents for help! To quote from Mr. Croly's life of Willard Straight: " The obstacles to an independent policy were, as Willard Straight also well knew, almost insuperable. Among them the one which looked most insuperable to the members of the group as practical bankers was the knowledge of their inability to float any very large volume of Chinese securities on the American market. *They were offering to lend money to China not because American investors were interested in business opportunities in the Far East, but because the state department wished to promote American influence in China.* They were obliged to consider first of all how and when they could redistribute the burden of the proposed loans and felt themselves dependent in this respect on the money markets of London, Paris and Berlin." Such was the instrument devised by our state department to advance American prestige in China and uphold its conception of the "open door." No wonder the European governments never took us seriously. In effect, the success of the American portion of the Hukwang loan, amounting to only $7,500,000 gold, was made possible because it was subscribed for largely by European investors who kept their securities in American safe-deposit vaults in order to escape the payment of the stamp taxes imposed on foreign loan bonds by their own governments.

Armed with a gun that wouldn't go off, and dependent upon the enemy for ammunition, the American government ventured into the thick of an international political fight hoping its hand would never be called. That Willard Straight was permitted to sit so long in the game and get away with what he did is a tribute to his ability and personality. Any other type of player lacking his *finesse*, geniality and lovable qualities would have jarred the nerves of the others and at the first bad break, would have been counted out of the game. Willard Straight played a losing hand according to the best American traditions. He won a number of hands that were not called and in the end had to divide his winnings with the other players.

Conditions are now reversed. America is the financial centre of the world and compromised to carry her European partners in any large Chinese loan flotation. We have the money, but Americans are still indifferent to business opportunities in China and because of the weakness of our diplomacy in safeguarding foreign investments, the support of the state department does not inspire the confidence that will enable our bankers to successfully issue a large Chinese loan. This guarantee so essential to the successful operation of the American group, is supplied by the consortium with its support of four great powers. Before the war, dependency upon European money markets compelled America to accept international co-operation in financing China; the same principle is now invoked in order to provide those guarantees without which the American investor will refuse to hazard his money in this country. So, if not in one way, then in another, international co-operation is essential to American success in participating in the development of China.

Had Willard Straight with his clear conception of justice and square-dealing lived long enough to learn of the existence of the secret Sino-Russian treaty of alliance of 1896 he would have been the first to recognize it as the missing key to the Chinese puzzle, the explanation why so many of his own schemes were frustrated. He would have conceded a tardy though none the less hearty justification to Japan whose presence in Manchuria he objected to as proof of a determination to duplicate the process by which Korea was made part of the Japanese empire. In his later years, Straight swung around and became an ardent supporter of American-

Japanese co-operation, conceding Japan's right to participate in the Siems-Carey canal improvement scheme without even referring the matter to the state department for approval.

In explanation of his resignation from the service of J. P. Morgan & Company Mr. Croly uses a letter written by his wife explaining his attitude during these years towards his business, and in this paragraph is seen the real character of Willard Straight, the idealist chafing under the fetters of practical business.

" Willard's abounding energy was contagious and exciting and his mental activity never flagged. He was forever dreaming dreams, albeit practical ones at that, and working out new ways of doing things and new things to be done. Almost every evening he would come home from the office with the same words on his lips—' I had a new idea to-day.' In spite of myself I was forced to become the critic, for though many of his plans were sound in conception the means of execution were often not at hand. In many instances he was unable to convince his superiors of the value of his ideas and then it became my task to prevent him from dwelling on what he considered his own ineptitude and to show him that circumstances themselves had created the *impasse*. Wall Street was uncongenial and difficult for him, though he loved and admired many of its leaders. His point of view was diametrically opposed to that of the business man. He felt the importance of building for the future as well as for the present, and to this end he worked to establish sound commercial relations with other countries irrespective of the return in profits. He did not like to bargain : he hated competitive enterprise. He wanted to see certain things done : he cared little who did them : and it nearly broke his heart to see his ideas still-born because they did not promise to become immediately profitable. He had plans for helping China, for the establishment of better trade relations with South America, for a labor policy in one of the big banking houses, for making old traditions live and new ideas circulate, for mutual understanding between the peoples of the world—plans in general for more enlightenment at home and for higher commercial morality abroad. Most of his plans were destined for the scrap-heap, though many were adopted with profit by his employers. But he was considered too radical, too much of an idealist, too deficient in business experience. He obviously needed another field for the exercise of his imagination."

The combination of politics and finance known as "dollar diplomacy" is a game omitted from the education of American bankers yet they were willing to assist the state department in every way for the advancement of national prestige in other lands. There was a limit, however, beyond which they could not safely go without incurring public condemnation. The activities of the American group in China raised questions which in those days could only have been solved by a resort to arms. The United States was being placed in a very delicate position from which it could not withdraw with honor except through war, or compromise. It was, therefore, only natural that, in adding up the balance sheet of its operations, a group interested solely in material profits should wonder where all this was leading the nation and it is not surprising that its displeasure should fall upon its representative. The achievements of Willard Straight in China when translated into figures in the ledger of the group occupied a very prominent place in the red ink column. Even in his subsequent activities as vice-president of the American international corporation, Straight was pursued by the same fate which transformed his other Chinese ventures from innocent looking commercial undertakings into dangerous international political issues. The Siems-Carey canal and railway contracts taken over by the American international corporation for financing had to be abandoned and later pooled in the consortium which their signature had made necessary as the only way Americans could participate in the development of China's railways.

Willard Straight's experience was that of other capable, ambitious and aggressive Americans who set out to save China from the consequences of her own follies. Other men imbued with the same high ideals accomplished equally big things only to see their work defeated by the operation of international intrigues combined with official ineptitude and changing policies at Washington. Straight left the impress of his personality on American activities in China, setting an example of high-mindedness and purity of motive which followed the best traditions of his country. His failures are traceable solely to an ignorance of political truths concealed from Americans by the operation of secret diplomacy. If Straight erred, so did all the rest of us. All his American co-workers saw things in the same light and their minds reacted in unison to the facts as we then knew them. Straight was right and he received a full measure of loyal support and the confidence of his countrymen in China. One of the reasons why Americans in China are now divided is because a large proportion is still living in the same atmosphere that Straight worked and moved in. Another section of the community recognizes that new facts have shed new light on the Chinese problem compelling a reversal of the old anti-Japanese outlook which guided Straight in his campaign to free China from what seemed at that time like deliberate aggression.

Straight was the true type of the idealist in finance, having little concern for business or profits as long as the principles he sought to establish were accepted. His life story as told by Mr. Croly is an inspiration for other young Americans ; the chapters describing his work in China a most important contribution to Far Eastern history, on a par with the " Secret Memoirs of Count Hayashi " and the " Memoirs of Count Witte." It rounds out the history of the days following the Russo-Japanese war and sheds the cold light of truth on the origins of American policies in Manchuria.

Willard Straight's biographer is inclined to lay too much emphasis on his part in bringing about international co-operation in the financing of China. From many points of view this was a worthy achievement but after all is said, the sad truth seems to stick out a mile high that such a solution to China's problems was forced upon the American group as the penalty for its rather theatrical entrance into Far Eastern politics, inadequately equipped financially to carry out the program of a government at that time wholly unprepared in a military sense to exact respect for its policies and lacking the moral support of the nation that would have justified a determined stand for the observation of the "open door" doctrine.

It is regrettable that a prominent American editor should so far forget himself as to permit the reproduction in a serious book of the most undignified, and uncalled for insult yet applied to the Japanese people. Such ignorance of Kipling and sowing of the seeds of racial hatred, calls for an immediate apology to the Japanese people from Mr. Croly and the Macmillan Company, and the repudiation of the book by the state department. One American diplomat is placed in such a delicate position that his future usefulness is seriously impaired through a reference to a secret code that only irresponsible and silly children would be guilty of using.

G. B. R.

Japan's Answer to America

SUMMARIZED in a few words Japan's official attitude towards the American exclusion act is one of dignified silence, resting her case for the present on a protest that the law is inconsistent with the terms of the 1911 treaty and pointing out the fallacy of the American explanation that the Japanese while not inferior are unassimilable. This, Japan contends, is a dogmatic argument not borne out by any conclusive fact. The reaction of President Coolidge, Secretary Hughes and public opinion in general to the exclusion law as being inconsistent with the sense of justice and impartiality and contrary to the ethics of international courtesy has influenced the Japanese government to reject the view that the immigration issue has been brought to a final or fundamental conclusion.

In fact, as far as Japan is concerned, the diplomatic battle is only beginning. Japan will be patient and permit America to be condemned before the world by her own actions and words. There will be no boycott of American goods. Business is not built on political sentiment and trade between the two nations will not be hurt. There is no thought of war or preparations for war. Japan's

case is too strong to permit it to be lost by any foolish display of anger. An over-sensitive congress has destroyed the work of generations but another congress can undo the harm and reinstate Japan in world esteem. America has armed Japan with a weapon whose legitimate use will align all the world powers with vital interests in Asia against us.

Although not voiced officially, there have been many semi-official statements and utterances of public men in Japan which challenge the right of Americans to assume that the Asiatic while not inferior, is unassimilable. There is a growing resentment against a doctrine which closes the doors of the west to the Asiatic and demands the right to invade Asia for the purpose of elevating the status of its people to the level of western civilization. The Japanese are asking why it is necessary for Americans to contribute annually millions of dollars to uplift the Asiatic if they are not held as inferior ? Does not this one fact, they argue, prove the inconsistency of America ? If we are equals, why force your doctrines of superiority upon us ? If we are not permitted to assimilate western culture and habits in a western environment, by what process of reasoning is it assumed that we will absorb American ideals and be elevated to American standards of morals and living by a religious or cultural campaign carried out amidst Asiatic surroundings ?

These questions are difficult of answer. No self-respecting people, be they white, black, yellow, brown or a mixture of two or all of these colors will suffer any longer than is absolutely necessary the implied slight concealed in a doctrine which bars them from lands because they cannot fuse in the melting pot and then proclaims the right to maintain their own countries an open field for religious, cultural and other propaganda which, however skilfully presented, implies the superiority of the proselyter. Sooner or later, America must answer this challenge from a race which resents our efforts to undermine the foundations of its own culture and civilization.

Japan's answer to the American exclusion act will be indirect. It will come through the application of a new policy towards China in which her own vital interests will be placed before those of her associates who have driven her to seek a fundamental solution to her problems in Asia. Reconstruction of Japan's policies based on the earliest possible abolition of extra-territoriality and the elevation of her legation at Peking to the status of an embassy is now practically decided upon. Ambassadors to Peking will be selected from amongst the foremost men of Japan, and China will be expected to send men of equal rank and prestige to Tokyo. The Japanese believe that their special relations with China demand the early application of this program.

One outcome of the exclusion agitation is that Japan is now convinced and alive to the necessity of bringing about a thorough mutual understanding with China. A fair and just policy that will cement the two nations together in ties of political, economical and cultural co-operation is entirely consistent with the objects of the Washington conference, and if other powers further postpone the conference for the abolition of extra-territoriality, Japan may take such independent steps as will assure to her people that outlet denied them in other parts of the world.

In another article we have drawn attention to America's remission of its share of the indemnity in order to advance its special cultural interests in China. It would seem that if one nation can evade its international obligations in order to further its special position in China, Japan is equally justified if she breaks away from her partners to the Washington treaties and placing her vital interests above those of her associates, enters into direct negotiations with China for the abolition of extra-territoriality. As the exclusion clause in the American immigration law forces Japan to seek a future outlet for her rapidly increasing population in the only place they can safely aspire to go, there could be no reasonable objection, if Japan should enter into separate negotiations with China for the solution of questions forced upon her by America. That the Chinese are now relying upon Japan to assist them in bringing to an early settlement the question of extra-territoriality is well understood in Peking.

Any such fundamental change in the Far Eastern political situation will sooner or later cause lively concern to those European nations whose interests in Asia may be placed in jeopardy by any radical departure from the *status quo*. The far-reaching consequences arising out of America's exclusion of Asiatics will not be confined to Japanese-American relations. All the powers having important interests in Asia will feel their effects. In the present temper of Europe, the United States can count on few friends who will stand with her as against Japan. If Japan should bring her case before the league of nations and demand a reopening of the racial equality question, arbitrarily dismissed by President Wilson when it came up for discussion at Paris, there is little doubt what the reaction of the members of the league would be. America would maintain its position regardless of what the league might say or do, but with Europe convinced that America has consistently shirked her international obligations, it goes without saying that its sentiment on the racial or immigration issue would be strongly against us if only for precipitating grave complications which seriously affect European prestige and interests in Asia.

Because of America's one-sided diplomacy as exemplified by our independent attitude after becoming a party to the Boxer protocol and our rejection of the Versailles treaty and withdrawal from the league we insisted on tacking to the terms of peace with Germany, together with our subsequent refusal to take an active part in the solution of post-war problems, we have ceased to count as a factor in world politics as far as Europe is concerned. Our allies in the late war resent our repudiation of responsibilities incurred at Paris and our insistance in giving advice without helping to bring to a practical solution the problems we assisted in creating. In the meantime, Japan has faithfully and scrupulously adhered to and carried her full share of the burdens imposed upon her by the league and in consequence has won many friends and created many obligations. From the European viewpoint, American domestic politics have once more flouted world opinion. In order to pass a useless law, reaffirm a right which no one disputed and respond to a menace that did not exist, the American government has deliberately sacrificed the fruits of years of prudent diplomacy and undone the good work of the Washington conference.

If the aftermath of Asiatic exclusion in America throws China and Japan closer together, causing Japan to stand solidly with China in international matters and breaks down the bulwark of foreign prestige in the Far East by the abolition of extra-territoriality, Americans cannot fairly hope to retain the cordial friendship of those great powers whose immense interests in China will be obliterated. For, with the abolition of extra-territoriality, disappears forever the right of the foreigner to interfere in China's affairs, the dawn of a new era in which the Asiatic will be master in his own house.

A petulant American senate playing picayune domestic politics has again thrust itself over the head of the state department into the arena of world affairs, jeopardizing world peace and the prestige and position of every European power in Asia. " After this, why continue to speak of the foreign policy of the United States. How can other nations expect from their American associates that constancy in purpose and persistance in effort which they do not practice in their own behalf," asks Pertinax in the *Echo de Paris*.

America has placed herself in a decidedly disadvantageous position by giving offense to Japan whose retaliation may lead to the elimination of European influence in Eastern Asia. Here, unquestionably, is one of those major political questions in which other nations besides America are affected by our independent policies. America has asserted her right (one which no other nation has ever disputed) to decide for herself a question involving her sovereignty over domestic affairs, without pausing to reflect or give heed as to how it might react on the vital interests of other white nations in Asia. America rejects the idea that immigration is a question which concerns the rest of the world and in so doing invites consequences which in time will completely undermine and destroy the carefully built up positions of our associates in the Far East. It would seem, therefore, that this is a question that might properly be submitted to an international conference, where some formula recognizing the right of each state to enact its own immigration laws could be adopted and at the same time avoid giving cause for offense or needless loss of prestige to other nations.

America's enormous wealth and potential strength may enable us to disregard world opinion and escape those obligations which a league of nations or an international court of justice might impose upon us, but, such a course has its obvious disadvantages. If we refuse to co-operate with the rest of the world in defense of their conception of a program that will operate for the good of humanity, we cannot expect them to adhere religiously to those policies devised by ourselves for the protection and advancement of our own special interests. There is always the danger of isolation or retaliation by others paying us in our own coin.

Asiatic Exclusion

Grave Consequences

AN interesting sidelight on the operation of American exclusion laws bearing out our contention in regard to real Chinese sentiment on this question, is seen in the charges recently preferred by the Chinese six companies of San Francisco in a communication transmitted through their attorney to President Coolidge and members of his cabinet. The substance of these charges is the long standing grievance over the treatment accorded Chinese merchants and scholars entering the United States and now extended to those traveling first class. The Chinese complain that these privileged classes are subjected to indignities, delays and unnecessary hardships at Angel Island where conditions are alleged to be insanitary and the officers hostile to Asiatics. These delays and hardships are not experienced by first class passengers of other countries and the Chinese six companies protest against the discrimination to which their nationals are subjected.

The revival of this grievance only serves to accentuate the fact that the undercurrent of resentment in China against our exclusion laws is as strong to-day as it ever was in the past. Although the stay-at-home Chinese may entertain most friendly and kindly feelings for Americans whose philanthropies he enjoys, this sentiment is not shared by his countrymen whose fortunes compel them to brave the ordeal of passing the officials charged with the execution of our immigration laws.

It is only a question of time when the operation of the Japanese exclusion clause in our immigration laws will subject eminent Japanese business and professional travelers to the same treatment now accorded the Chinese and although our officials may perhaps see no indignity in the methods employed in the execution of their duties, the sensitive Oriental gentleman will experience a loss of face that may be borne meekly, or otherwise.

The charges submitted to the president by the Chinese six companies were answered by the U.S. immigration commissioner at the port of San Francisco who says that the law calling for the examination of first-class cabin passengers from China was invoked last January by the department of immigration when it was shown that Chinese laborers were slipping into the country in first-class cabins. This, of course, is probably true, for when the risks and costs attending the smuggling of Chinese laborers into American territory from Mexico, Cuba, Jamaica and other near-by countries are considered, it is only natural that the comparatively easy and more economical route via a first-class cabin passage will be adopted by those who can afford it.

It is only a question of time when similar charges will be brought against the Japanese. It is difficult to believe that federal officials at the port of San Francisco appointed from the state of California will be free from the influence of the labor unions and organizations whose long-drawn-out campaign against the presence of Japanese laborers in their state has finally resulted in their exclusion from the country. In the same way that the number of Japanese who came in legitimately was exaggerated, this same element will now declare that the law is being evaded by laborers entering the country as first-class passengers under the privileges accorded the exempted classes. The demand will be made for a more rigorous application of the law subjecting all Japanese first-class passengers to the same treatment now accorded the Chinese. The Chinese have complained time and again without any apparent amelioration in the rigid application of the law. If Japanese travelers of prominence are subjected to the same treatment it will result in an intensification of the existing bitter feeling against Americans and provoke an energetic protest on the part of their government. The protest may go unheeded but it will unite the Chinese and Japanese into a closer bond that in time will be expressed in retaliatory measures.

Americans cherish the hope that their altruistic and disinterested policies towards China will in time enable their influence to dominate the Orient but it is difficult to visualize the realization of such dreams when the application of our exclusion laws humiliates the best classes of the people we most desire to impress. For the time being we have broken down the resentment of the Chinese by posing as the champion of their sovereignty against the encroachments of other powers; we have silenced their protests and drowned their complaints by the clink of gold poured into the country for uplift work, but the time will come when the Asiatic will declare his independence and demand the right to live his life according to the ages-old ideals upon which his civilization is founded. The East will not always tolerate activities based on the assumption that its civilization is inferior to that of the West. It will resent the hypocrisy embraced in the formula "it is not that we consider the Chinese or Japanese inferior that we exclude them, but because they cannot assimilate our ideals and civilization."

The time will come when the Asiatic will challenge the doctrine which holds them as inferior in the lands of the West and makes their own countries a field for the unrestricted activities of missionaries, philanthropists and general uplifters whose main purpose is to elevate their status to conform to western standards of civilization. From this point of view it is sheer impertinence to bar the Asiatic from America because of his alleged unassimilability and menace to Western institutions and then foist our standards upon him in his own home under the provisions of treaties extracted at the muzzle of the gun. If the Chinese and Japanese are not considered as an inferior race, why should Western nations continue to contribute millions annually in order to force our civilization upon them?

If any foreigner entertains the delusion that the Chinese meekly accept our assumption of superiority, his mind will be disabused of this hallucination by reading what Mr. Liang Shih-yi had to say to a gathering of Chinese students in London only last month. He told his young countrymen that while they were absorbing the civilization of the West not to forget to transmit something of their own, for in many respects the civilization of the East was superior to that of the West. The West," he added, "prided itself on many material inventions that were known to their forefathers centuries ago, but the Chinese had never advertised their knowledge nor had they attempted to force their civilization upon others." Here spoke the real voice of old China. The East has never forced its civilization upon others. In fact, all it asks of the world, is to be let alone. The words of Mr. Liang interpreted rightly mean that while outwardly acquiescent, China deeply resents the forcing of Western ideals upon a people schooled in a philosophy which has stood the test of centuries.

It was only a few weeks ago that a speaker at the national conference of Christian associations in Japan declared that America is responsible for commercializing Christianity and advocated shaking off the "monetary yoke" the parent missionary bodies in America have saddled on Christian organizations in Japan. In other words, Japanese Christians resent the employment of American gold for the maintenance of missionary bodies whose activities are slowly sapping the foundations of a civilization which has held the nation together for centuries. Liang Shih-yi said the same thing more diplomatically, reflecting the general sentiment of Chinese scholars and thinking men who have watched the missionary activities in their own country grow from small beginnings into an army of workers whose vested interests now overshadow in importance those of legitimate trade. The Chinese have seen the missionary, educational and philanthropic interests of America grow into a position of power where they practically dictate the policy of their government and influence the selection of its diplomatic representatives. They have silently witnessed without protest the gradual undermining of their institutions and ideals before a propaganda backed with unlimited millions under the pretext of improving their status and raising it to the level of the West—and deep down in their hearts they object to it.

The American exclusion law has started a train of thought in Asia that will have far-reaching and grave consequences to the interests of every foreign nation in this part of the world.

* * *

For a Better Foreign Service

AMERICANS who believe that their government is called upon to intervene in China and bring the blessings of our beneficent tutelage to its distracted people, should read the speech delivered by Secretary of State Hughes at the Hotel Astor in New York on May 15. In a pessimistic survey of domestic politics

Mr. Hughes asserted that the American people appear to be failing in self-government. "Our greatest difficulty," he said after reviewing American success in private fields, "seems to lie in government. We seem to make a mess of that. In our forty-eight commonwealths and hundreds of municipalities and in our federal organization we have the greatest profusion of governmental agencies and through candidacies and campaigns of one sort or another the most unceasing activity the world has ever seen under one flag."

Although the secretary did not touch upon the relations existing between the federal government and our over-seas territories he might well have emphasized these as conclusive evidence in support of his argument. Territories, naval stations, possessions, protectorates and other territorial responsibilities are administered by different departments of our government, while the development of Alaska is throttled under the supervision of some twenty independent commissions or bureaus. It is one grand mix-up. An intelligent policy directing our activities in these widely scattered regions is lacking and as a result every man Jack of the mixed races, languages and religions in each and every one of these lands that prosper under our altruistic guidance, are discontented and pray to their various deities to be delivered from our philanthrophy. They don't want us and lose no opportunity in letting us know it.

Americans were already headed for a fall in China where under the enjoyment of extra-territorial privileges conferred by the treaties their activities had become so confused that every department of the government with the exception of the interior, was functioning and exercising jurisdiction of sorts over their nationals. In certain instances, officials of these departments attempted to assume precedence over the diplomatic and consular services which under the treaties represent the federal government in foreign lands.

Secretary Hughes may have had this situation in mind when he asserted that Americans made a mess of their own government and he might have told his audience how in China the department under his direction had finally asserted and established its authority by bringing about a system of co-operation and co-ordination that might well serve as an object lesson in the administration of non-contiguous territories, a precedent for the reformation of our chaotic "colonial" service under a special bureau responsible to the state department. With the Philippines, Hawaii, Porto Rico, the Canal Zone, Virgin Islands, Santo Domingo, Haiti, Samoa and Guam and other non-contiguous territorial responsibilities governed by trained officials of the state department the nucleus of a foreign service would be created that would attract the best men in the country and in time develop a governing group equal to the best in England. We know of nothing that would conduce more to the prestige of the American government abroad and at home than to bring all our over-seas activities under the supervision of the secretary of state. Such a step is a logical corollary to the foreign service bill, the one essential towards the creation and development of a department which in the last analysis, is responsible for our foreign relations and the settlement of disputes that must arise from time to time between these non-contiguous possessions and their immediate neighbors. Perhaps one way to educate the American people to the realities of government, especially in so far as they relate to the co-ordination of activities in our dependencies, is through the creation of a foreign service department which would serve as an object lesson to the others. As long as the present system, or lack of system is permitted to continue, we will make a mess of governing other peoples.

American Co-operation in China

As a direct outcome to the lack of co-ordination of American departmental activities in China and to the independent attitude assumed by businessmen in passing strongly-worded resolutions demanding intervention in the affairs of this country and to articles printed in this magazine calling attention to this state of affairs, the president of the United States on April 14 issued an executive order which clearly defines the centre of American authority in foreign lands. In all cases the officials of the state department take precedence over the officials of other American government services assigned to duty in foreign lands. Fortnightly meetings are required to be held under the direction of the highest officer of the diplomatic or consular service at which all officials of other departments must attend and report their activities. Outwardly, the order is one which exacts co-operation and the recognition of credit where credit is due, but underneath its formal wording is a determination to put a stop to further encroachments upon the functions of the state department by officials of other departments detailed for work or observation abroad. The channel of communication with the government at Washington must be through the state department, a ruling extending to commercial and other associations which in several instances have ignored the existence of the responsible authorities in communicating with the government at Washington.

As far as China is concerned, American interests have been impaired by the utter absence of harmony between the official, missionary and business elements and as a consequence officials at Washington could do little to properly advance national interests in this country. As a last resort, the president was induced to issue the executive order in order to bring Americans together in some sort of common understanding under responsible leadership.

Following the receipt of this order, Minister Schurman journeyed from Peking to Shanghai to effect a clearer understanding and closer co-operation between the American legation, consulates, businessmen and missionaries and to work out a co-ordinated policy and definite program to be followed by all groups. The interests of the businessman will be fostered and advanced as part of the general national program, and he will learn just what limitations he must work under in order to co-ordinate his private interests with the welfare of other legitimate national activities in this country. In other words, President Coolidge has set an example in China that might well be followed up by the application of similar principles in non-contiguous territories of the United States under a service specially created for this purpose.

* * *

Mitsui and Uncle Sam

DURING the oil investigations at Washington an ex-secret service spy by the name of Gaston B. Means blew the lid of the department of justice by testimony which left the American public gasping. He told of shadowing senators and other public men and even Secretary Mellon of the treasury department, a story of wholesale intrigue and espionage that recalls the days when Fouche kept Napolean accurately informed of the movements of all officials of the state. His story indicated a state of affairs in high places in Washington more shocking than anything yet brought to light in connection with official corruption in other countries. Fortunately, his word was unsupported; the proofs were lacking and judgement has been suspended.

There was one point in his testimony, however, of special interest to our readers having to do with an alleged cash bribe of $100,000 paid by Mitsui & Company to prevent an investigation into the affairs of the Standard Aircraft Company charged with having defrauded the government in the aircraft scandal during the war. It was found that Mitsui & Company had financed the aircraft enterprise and it was alleged that this financial interest was the cover under which American military airplane designs were acquired and transmitted to the Japanese government. This, of course, excited public interest and was seized upon by the anti-Japanese element to stir up resentment against Japan. The fact that Mitsui & Company's lawyers is the eminent firm of Caldwalader, Wickersham & Taft (one of the partners a former attorney general of the United States and another a brother of a former president and present chief justice), seemed to make no difference to the anti-Japanese agitators. The further fact that Mitsui & Company aided in furnishing the capital for the Standard Aircraft Company because it wanted to be of some assistance as an ally to the United States in winning the war, carried little weight. American capital might be employed freely in the industries and enterprises of its allies, but to reverse the principle and admit foreign capital, especially Japanese, into an American war industry seemed to savor of treason.

It is interesting therefore to read the full denial of the charges brought against the Japanese firm in which the latter offered to submit their books to a full investigation by the proper authorities. The denial and offer were contained in a letter signed by Shigeji Tajima, New York manager of the company, which was sent to Senator Smith W. Brookhart and the other members of the Daugherty committee.

The manager summed up the situation by stating that Standard Aero and Aircraft corporations were devoted exclusively to the production of airplanes for the United States government, and that

Mitsui & Co. financed the company and received in exchange only 6.7 per cent. interest on the money, and "no profits whatsoever." The letter follows:

New York, April 4, 1924.

Hon. Smith W. Brookhart, Chairman, Daugherty Investigating Committee, United States Senate, Washington, D. C.

DEAR SIR,—It has been reported in the press that Gaston B. Means, a witness called before your committee upon the investigation of Attorney General Daugherty, testified that he received from a Japanese, who stated shat he represented Mitsui & Co., the sum of $100,000, and that he turned this sum over to Jesse Smith. In some of the newspaper accounts it is stated that it was Jesse Smith who informed Means that the sum had been received from Mitsui & Co. As the opportunity to meet this testimony may not be afforded to us, or may be postponed for some time, I deem it proper at this time to make an emphatic and comprehensive denial of the truth of the statement made by Mr. Means. I also deny with equal emphasis the statement reported to have been made by Mr. Means that Mitsui & Co. has ever acted, directly or indirectly, as paymaster for the German government, or has received or disbursed money for the account of that government. The same may be said with reference to the Japanese government. We never have acted as the fiscal agents of that government in this country.

Makes an Unqualified Denial

I am the manager of Mitsui & Co. at its principal office in this country, which is in this city, and I am consequently familiar with every detail of its financial transactions. If there had been any such payment as that mentioned by Mr. Means it would certainly have come to my attention, and, of course, would have been reflected in the accounts of the company. I am, therefore, able to assert without qualification that no such transaction was ever authorized or ever took place. No sum of money was ever paid to Mr. Means or to anyone else connected with the department of justice, or with any other department of the government, in connection with the Standard Aircraft transactions. This may be confirmed by an examination of our books, which you are at liberty to make at any time.

Mitsui & Co. held the preferred stock of the Standard Aircraft Corporation, and that corporation was indebted to it for money advanced to an amount of nearly $2,000,000. After a settlement of pending contracts with the government on June 24, 1919, the corporation was dissolved and out of the moneys received from the government Mitsui & Co. received from the corporation the par amount of the preferred stock, in addition to the amount of the indebtedness for the advances above referred to, with interest. The representatives of the government asserted that, upon the establishment of the claim against the aircraft corporation, they proposed to procure reimbursment from Mitsui & Co. for the amounts so received. The claim against the aircraft corporation was first asserted through the air service bureau of the war department in June, 1921.

This situation made it necessary for Mitsui & Co. to see to it that a suitable defense was made to the claim of the government.

Auditors of the government made an examination of the books, accounts and vouchers of the Standard Aircraft Corporation. Over thirty persons were occupied upon this audit for a period of about five months. The report of the audit was furnished to us and the auditors of the receiver of the Standard Aircraft Corporation were engaged many months in examining the conclusions of the government auditors and were able to show that the report of the government auditors was so full of inaccuracies and mistakes as to be practically worthless. Upon the reports of the auditors of the government and of the receiver of the Standard Aircraft Corporation, protracted hearings were had before a board of five members in the air service, liquidation branch, finance section, of the war department. Elaborate briefs were submitted to the board and the whole matter involved consideration of voluminous documentary evidence. The record of these hearings is, of course, a matter of public record available to your committee. The brief submitted by our counsel, Messrs. Cadwalader, Wickersham & Taft, was printed and dealt with every aspect of the claim. It is a document of 260 printed pages, and I beg herewith to hand to your committee a copy of it.

Dealt with War Department

At no time since the claim was asserted have we or our counsel appeared before or had any communication with any representative of the department of justice. If that department has been consulted concerning the merits of the claim of the government or our defense, it has been without our knowledge, although some quite indefinite rumors came to us at one time that the department was making some kind of an investigation. But so far as we are concerned, in February, 1922, and ever since, the matter has been in the charge of officials of the war department.

Some mention was made in the testimony of the witness Means of statements made by Harry B. Mingle, a former president of the Standard Aircraft Corporation. Mr. Mingle was not familiar with the details of the claim of the government. The Standard Aircraft Corporation had been dissolved, and as one of its liquidating trustees he had possession of its records and books. He early assumed an attitude of antagonism to Mitsui & Co. As neither he nor the dissolved corporation had the sources to present a proper defense, it became necessary for Mitsui & Co. to cause steps to be taken to procure from Mr. Mingle the custody of the books, papers and records of the corporation which were in his possession. A suit in equity in this state was, therefore, commenced and resulted in the appointment of a receiver, Mr. Wilson M. Powell, who was represented before the war department board by our counsel, Messrs. Cadwalader, Wickersham & Taft, who have been ever since in charge of the matter. The controversy which led to the termination of all control by Mr. Mingle will appear from the bill of complaint and affidavits in the equity suit, a copy of which I beg herewith to hand you.

Captain Scaife, who was a witness before your committee, made certain statements which I desire to correct. He is evidently incorrectly informed as to the proceeding in the war department, which I have accurately described above. If the committee desires to advise itself as to the condition of the audits referred to by Captain Scaife, we presume that they will be produced by the war department upon request.

Captain Scaife is reported to have said that a Mr. or Major Coleman, who was a disbursing officer in the air service when considerable sums were paid upon the contracts of the Standard Aircraft Corporation, was in the employ of Mitsui & Co. at the time the audit referred to by him was made. This statement is entirely without foundation. Mr. Coleman was never in the employ of Mitsui & Co. I never heard of him.

The newspapers reported that Mr. Lane made a number of statements in regard to the amounts paid by the government to the Standard Aircraft Corporation on account of depreciation and raw material. His statements are not true. For example, the statement that the asset account of Standard Aircraft Corporation included a loss of $1,619,000, sustained by Mitsui in financing the Sloane Manufacturing Company, is wholly without foundation. The exact facts appear in detail in the audit prepared for the receiver of the Standard Aircraft Corporation and filed in the war department. They are discussed in considerable detail in the enclosed printed brief, filed with the war department.

To sum up the whole situation, we wish to call the attention of your committee to the fact that the Standard Aero and Aircraft Corporations were devoted exclusively to the production of airplanes for the United States government and that they were financed by Mitsui & Co. out of their own resources, and that Mitsui furnished all the necessary working capital and received in return only the money which it had invested in and advanced to the corporations with 6 per cent. interest and absolutely no profit whatsoever. This is not a case where any war profits were received. All production was under the strict supervision of the United States government officials. The employes were all Americans, and Mitsui only aided in furnishing the capital because it wanted to be of some assistance to the United States and allies in winning the war.

If I or any other person connected with Mitsui & Co. or the counsel for ourselves or for the receiver can be of assistance to you in a further investigation of this matter I shall be glad to have you call upon us.

Yours very truly,
SHIGEJI TAJIMA.

* * *

France and Japan

TOKYO may deny and the Quai d'Orsay protest till it is blue in the face that the recent visit of Governor-General Merlin to Japan had no international political significance, but world politics being as they are it is only natural that explanatory official *communiqués* will be interpreted as smoke screens thrown out to

conceal the real object of Franco-Japanese *rapprochement*. No amount of specious reasoning can disguise the truth that France feels that she has been abandoned by her late allies to face alone the menace of a reinvigorated and vindictive Germany now reinforced by Russia, or that she holds America responsible for her present desperate position.

What is true of France, is true in equal measure of Japan. America congratulates herself that Far Eastern and Pacific questions were settled for the next ten years at Washington, but there was one defect in the treaties signed at this conference that can only be remedied by separate understandings between the powers most vitally concerned. That defect was the failure to include Russia in the parley and provide a real substitute for the Anglo-Japanese alliance. Americans could see in this instrument only what their own fears and Chinese propaganda wished them to see—a possible menace in the event of a war with Japan. In destroying an effective instrument and replacing it with a four-power alliance to respect each other's territories in the Pacific, Japan was left to oppose single-handed the pressure of Russia on China and Eastern Asia.

The elimination of the Anglo-Japanese alliance was a great victory for American diplomacy, but as we have pointed out on various occasions, our security in the Pacific was purchased at the expense of Japan in Eastern Asia. We gave Japan nothing in exchange for a sacrifice which deprived her of a formidable ally at a time when her traditional enemy was coming into her own. We turned back the pages of history thirty years and must now pass through another cycle of secret understandings which will undo the good work accomplished. We abandoned France to work out her own salvation in the face of a German "come-back" and then isolated Japan, stripping her of every legitimate defensive advantage gained as a result of unremitting vigilance and preparedness over a period of twenty years. The most natural thing in the world is for the two isolated powers to come together in some understanding that will offset in part the selfishness of their world partners.

As a side-light on this situation we are informed that a Japanese commission recently visited Bukharest to arrange military co-operation between Japan and Roumania in the event of a Russian attack on either country. Roumania, it is well known, may be forced into a conflict with Russia for the possession of Bessarabia. Now, Roumania is a member of the little *entente*, consequently, a *protege* of France. Merlin's visit to Tokyo may have been confined to extending the scope of Franco-Japanese commercial activities, but with the knowledge that France has not yet ratified the Washington treaties; that Japan's position in Eastern Asia is daily becoming more precarious; that France and her *proteges* of the little *entente* are uneasy over the moves of Russia and Germany; that both Japan and France are alarmed over the proposal to build a huge British naval base at Singapore; it would seem to be a reflection on the intelligence of the French and Japanese governments if M. Merlin failed to discuss these problems during his recent visit to Tokyo and propose some plan for united action in the event either country was pressed too hard.

Such thoughts may be discouraging to the people of many countries interested in building up international tolerance and good-will and who see in such coalitions an invitation for counter coalitions, but what other remedy can Japan, France and the little *entente* apply to offset the sinuous return of Russia to a position which menaces the vital interests of them all? France stands alone, so does Japan, with no international guarantee worth the paper it is written on, that other nations will come to their assistance in case they are attacked.

We have recently witnessed in China's recognition of the Soviet and the latter's reinstatement to a position of equal control over the Chinese Eastern Railway, one potent reason for a Franco-Japanese understanding. French financial claims added to Japan's legitimate equity in the line as spoils of war denied to her at Portsmouth through the operation of secret diplomacy and her financial claims provide these two powers with an argument for standing together that must carry considerable weight and command due respect if supported by a determination to employ force for the protection of their interests.

It was not for nothing that Baron Shidehara, newly appointed minister for foreign affairs in Japan, recently said that "the foreign relations of Japan are now confronted with many and various perplexing problems and in the future Japan may expect these to increase and become still more difficult and the nation must be prepared to meet these troubles with a just and courageous stand. Machiavellian diplomacy and aggressive programs are things of the past and international relations must proceed on the broad principles of justice and peace as exemplified by the Versailles treaty and the Washington conference."

This is certainly the right spirit, but it is apparent that Japan's foreign minister recognizes that in adhering to it the limitations of diplomacy will be taxed to their utmost to find an honorable solution to the increasing perplexities of the many problems forced upon the nation through the treaties of Versailles and Washington. Baron Shidehara knows that Far Eastern problems were far from being solved at Washington and that unless some extension of the four-power treaty is made that will protect Japan's interests in Eastern Asia, a supplementary convention may have to be made with Russia or failing this, with France and the little *entente*.

We may fool ourselves that the affairs of Eastern Asia were nicely settled at Washington, but time will prove that neither Japan or France can be isolated, stripped of their defenses and exposed to the certain attack of powerful and vindictive enemies without somebody paying the penalty.

Remarkable Change in America's Foreign Trade

Far Eastern Markets Most Promising Asset

AMERICA is a favorite of fortune. No matter how indifferent our investors are to Far Eastern industrial possibilities, and despite chaos in China and other considerations which should operate against our trade expansion, the balance in our favor keeps piling up year by year until the Asiatic market bids fair to become our most valuable asset. What the figures would be under a more enlightened and aggressive program, proper advertising of our products and pushing salesmanship, is left to the imagination after digesting the current trade returns. In calling attention to this remarkable change in our foreign trade, The National City Bank of New York says that when Europe was plunged into war, it slowed down production, with two results. It partly disabled itself from buying and it largely abandoned to us the foreign markets which it had supplied. Latterly, our trade with the Orient has in a measure made up for declines in our trade with Europe. In the eight months ending with February our exports to Asia and Oceania increased 44 per cent. For the fiscal year ending with June, our exports to that region promise to exceed $700,000,000, as against $200,000,000 in 1914.

Japan's needs after the earthquake enlarged her takings of materials, bought with borrowings from America. But that is exceptional and not in the same class with the fact that our sales to Oriental buyers were 75 per cent. manufactures, and largely machinery. There was an item of 34,568 automobiles during eight months of the current fiscal year thus far reported. That is an increase of 156 per cent., over the same period of last year, while those to other parts of the world increased only 44 per cent. We sold to Oriental

customers 23,000,000 pounds of tinplate, against only 1,000,000 last year. We sent China 35,000,000 pounds of copper, against 14,000,000 and more than doubled our flour exports to that country. Of cultural significance is the doubling of our exports of printing presses to the British Orient. Thus far, at least, we have held our own in the post-war competition of production at costs permissible in world trade.

These are the greatest unexploited markets in the world. If the Orient were to consume on the same scale as the Occident the potential demand would be too great for any but the boldest to calculate. If the whole world ate bread at the same rate as Americans there would be a world demand for eight times as much flour. If all other nations drank coffee as freely as Americans a ninefold production would be required.

Larger Returns Through Advertising

Of special interest to the engineering trade is the increasing market in Japan for machinery and tools of all kinds. According to Trade Commissioner P. P. Steintorf the most important single item in America's exports to Japan is machinery which, although fairly well advertised, would reap large benefits by a more thorough and comprehensive campaign. Other commodities include machine tools and industrial equipment of all kinds, and construction and railway equipment and supplies.

Specialties such as typewriters, cash registers, adding machines and office equipment have an excellent field, as the Japanese are always eager to adopt new things. There are shops in Tokio with a total floor space of 10 by 12 feet which have as their chief article of furniture an elaborate cash register. This is cited by Mr. Steintorf as an example of the universal Japanese tendency to utilize modern implements—a tendency that could be used to advantage in extending the sale of American specialities.

Reconstruction Orders

Although reconstruction purchases of permanent materials have not been made in any large quantities, several important orders have been recorded amongst which is one placed by the Japanese government with the Nippon Electric Company (the Japanese subsidiary of the Western Electric Company) for automatic telephone central office apparatus to the value of $3,500,000 to equip five central stations to serve 25,000 subscribers. This apparatus will, however, be manufactured largely by the Automatic Telephone Company, Ltd. of Liverpool, one of the enterprises associated with the International Western Electric Company. An electric generating plant to cost $25,000,000 has been provided for in this year's budget to be erected on the Shinano River for the supply of power to the government railways and the service of Tokyo.

Manchurian Possibilities

An important development in American trade through the sale of equipment to the South Manchuria Railway is being made by the appointment of a special American investigating committee with headquarters at the consulate in Mukden.

American trade in Manchuria now occupies second position, the amount reaching nearly $25,000,000 gold a year. The American committee includes a member of the consulate-general at Yokohama, well versed in Japanese, and a Japanese clerk working with the Mukden consul-general, two vice-consuls and several American and Chinese staff.

Commenting on this, development an official of the South Manchuria Railway Co. said:

"Articles imported from the United States into Manchuria include railway apparatus, machinery, steel, cotton yarn and piece goods, petroleum, and flour, the last mentioned being imported in large quantities, exporting beans and bean oil principally. Thus far, Americans in general influenced by prejudice, were inclined to keep away from the Japanese. Of late this attitude has greatly changed, Americans realising the importance and advantage of co-operating with the South Manchuria Railway Co., if they wish to expand their trade in Manchuria, and are now trying to come as near to the Japanese as possible. This is most encouraging for advancing the economic development of the region, which cannot be undertaken by Japan, or China alone but can be carried out by Americans. The business of the South Manchuria railway will be much increased, hence there is every necessity for the Company to give them all assistance they require."

Co-operative Cotton Sales Office

A rather important and significant development following closely on the heels of the passage of the exclusion law, is the determination of the cotton co-operative associations of the south to hold and extend their trade with Japan by having their own sales representative on the ground. Japan is using over 700,000 bales of American cotton every year, and General Sales Manager C. B. Howard, of the southern cotton exchange, believes that Japan offers the co-operative marketing associations a good field and will open a sales office in Japan within a very short time, the first sales office in the Orient.

Far Eastern Trade Returns

The actual figures of Far Eastern trade returns compiled by the U.S. department of commerce show that the increase in Far Eastern trade of the United States accounted for half of our total trade increase in the nine months ended March, 1924. Our exports to the Far East increased $154,458,508, or 38 per cent. during that period, and our imports from the Orient declined $29,040,174, or 4 per cent., making a net increase in total trade of $125,418,329. Every country in the Far East took more of our goods this year than they did last year for the same period.

Far Eastern trade amounted to 23½ per cent., of our total trade for the nine months as against 20½ per cent., for the corresponding nine months of 1923.

Exports to Japan account for the greatest increase, from $157,154,636 in the nine months ending March, 1923, to $243,804,552 in the same period for 1924, increased shipments of raw cotton bought forward at favorable prices last summer account for some of the increase.

Exports to China increased from $72,374,350 in the 1923 period to $91,843,478 in 1924.

Exports to Australia show a remarkable increase from $68,892,690 in 1923 to $95,987,232 in 1924, Australia forging ahead of China as the second country in our exports to the Far East.

Exports to the Philippines increased 25 per cent., to $41,345,080 in 1924; exports to India 15 per cent., to $24,792,032; exports to New Zealand 13 per cent., to $19,201,574; exports to Dutch East Indies, 36 per cent., to $9,891,953 and exports to the Straits Settlements 6 per cent., to $5,131,594 for the nine months' period.

Decline in imports was general except from Straits Settlements, which showed an increase from $85,534,025 to $98,971,623; Dutch East Indies an increase from $31,887,372 to $38,817,017, and the Philippines from $48,421,610 to $55,210,095. China showed a slight increase of less than one per cent. Imports from Japan declined 14 per cent.; from India 5 per cent.; from Australia 28 per cent., and from New Zealand 10 per cent.

Imports from China

The growing importance of the raw and semi-raw materials of China to the United States is shown by the increasing importation of these products. Imports into the United States from China during 1923 aggregated $187,602,172, as compared with $134,609,105 in 1922, an increase in two years of nearly 40 per cent. These imports for the most part are basic raw materials for use in further production and the most important single product is silk, which represents about 44 per cent., of the total imports from China. In 1923 China imports of silk into the United States amounted to 12,261,561 pounds, valued at $83,395,432, as compared with 8,378,079 pounds in 1922 with a value of $56,609,881. China's share in the total raw silk imports into the United States in 1923 amounted to approximately 21 per cent., which is an increase of about 5 per cent., compared with 1922.

That China teas were in greater demand in the United States last year than for some time, was indicated by the aggregated imports of $3,330,166, which is an increase of $1,202,451 over 1922 imports. Chinese teas, formerly one of the principal exports of that country, are beginning to return to old markets with annually increasing shipments.

Wood oil imports from China, which is practically the only source of supply for the United States, increased from $7,891,251 in 1922 to $13,397,000 in 1923, which is the largest importation of this commodity into the United States on record. The growing dependence upon China for this almost essential ingredient in the manufacture of paints, varnishes, etc., is indicated by the increasing demand from the United States.

Other products of China which showed material advances during 1923, are carpet wool, raw cotton, goat and kid skins, soya

bean oil, carpets and carpeting, and miscellaneous hides and skins. Other commodities which figure less prominently in the imports from China are bristles, eggs and egg products, laces and embroideries, hairnets, strawbraid, etc.

Japan Takes 26 Per Cent. of American Steel Exports

The following table shows the proportion of seven leading American steel products sent to Japan in the five years since the war and the total exports in gross tons :—

American Exports, 1919 to 1923, Inclusive, in Gross Tons.

	Total	To Japan	Per cent.
Steel plates	2,170,164	508,013	24.3
Rails	2,115,398	555,794	26.2
Black sheets	894,162	453,309	50.7
Tin plate	739,731	188,947	25.5
Galvanized wire	655,899	123,506	18.8
Galvanized sheets	490,160	41,515	8.4
Wire nails	312,067	85,885	27.5
Total	7,377,581	1,956,969	26.5

A nation which purchases 26.5 per cent. of a country's steel exports over a five-year period is of vital importance to that industry's foreign trade says the *New York Journal of Commerce*. The buying of over half the foreign sales of black sheets and practically one-fourth the foreign shipments of four other leading products must have some influence on the market trend in each case.

No other steel exporting country can point to a similar situation in its foreign trade. Too much dependence on one or two countries is not to be desired. But were it not for Japanese and Canadian purchases our exports would sink to insignificance. In any event, the thought is uppermost whether it is wise to legislate away the friendship of a people whose power as an industrial factor in the world's trade has only commenced and whose influence in the Pacific and in the development of the Far East will be larger rather than smaller. As a nation in need the co-operation of Japan has more than one aspect.

China's Silk Exports Affect Japanese Industries

Perhaps the most striking feature of the United States trade returns is the increase in the volume and value of silk imports from China, which last year reached 12,261,561-lb. valued at $83,395,432 or about 44 per cent. of the total, compared with 8,378,079-lb. valued at $56,609,881 in 1922. This increase was due in part to the temporary breakdown of the Japanese silk market following the earthquake and fire and to the sustained propaganda conducted by the silk association of America to offset the rather fickle fluctuations of silk quotations in Japan. At the present rate of growth it will not be many years before China's silk exports will deprive Japan of her pre-eminence in that industry. Far-seeing Japanese are looking ahead to the time when they must face this radical change in their economic conditions and are planning to establish other industries or expand their present facilities in order to live. This, they admit can be accomplished only by a readjustment of wages and living standards that will permit them to manufacture and export other products on a much larger scale than heretofore.

The competition created in China in order to break the Japanese silk monopoly, must result in the long run in handling over to Chinese control the industry upon which rests Japanese prosperity. China's capacity for silk production under more enlightened methods must be enormous but as in everything else, the absence of reliable statistics makes difficult any exact estimate of her total output. This is generally estimated as twice the volume of exports.

The trade returns for the past ten years show the following :—

	Bales		Bales
1912	121,877	1918	96,366
1913	119,344	1919	131,566
1914	87,517	1920	82,530
1915	109,093	1921	113,980
1916	103,561	1922	66,193
1917	107,584	1924	79,783

It is difficult to forecast the future of an industry whose output is so inconstant. Much study is being given to its possibilities by the Japanese who find it subject to many risks and attended with difficulties, foremost amongst which is the question of exchange. While the Japanese are inclined to look on the Chinese industry as most profitable, the hazards of exchange keep them from investing their capital in it. The menace of Chinese competition is therefore forcing the Japanese to give serious thought to the salvation of their own industry which will probably result in a stabilization of prices and a still further improvement in sericulture.

* * *

Building on Quicksand

Farmers Cannot Rely on European Markets, Says the Institute of Economics*

"FOR the United States to plan its agricultural future on the assumption that Europe may be induced to buy large quantities of American foodstuffs at higher prices than now prevail would be to build on quicksand." This is the conclusion of the institute of economics, based on an exhaustive study of European needs, European purchasing power, and the competition offered by other food-producing countries. The study has been made by Dr. Edwin G. Nourse, a member of the council of the institute and president of the American farm economics association.

"The limited European market which now confronts the American farmer," says the institute, "is the result of conditions which were developing even before the war. About the turn of the century American agricultural exports began to decline, owing to a combination of influences. European countries were increasing their own production of foodstuffs, and the competition of Canada, South America, South Africa, and Australasia for the European markets was increasing. At the same time, the growth of our own domestic market was lessening our exportable surplus.

"The great war reversed this current for a time. Not only were the European demands for foodstuffs increased; but, in consequence of the shipping problem, the United States became the most available source of supply. In response to the increased demand and to the cry 'food will win the war,' food production was greatly increased. Prices were high and unprecedented prosperity came to our farmers, resulting in the disastrous land boom with which all are familiar.

"When the war ended, it was naively assumed that these war-time demands and war-time prices would continue indefinitely. Immediately following the armistice they did continue for a time, being made possible by additional extensions of credit. This piling up of debts to the United States, however, could not go on forever, and the inevitable collapse came in 1920.

"To-day," concludes the institute, "the pre-war trend of decreasing exports has been renewed in intensified form. Europe's agricultural production is being restored faster than her industry, and, consequently, than the buying power of her cities. And the competition of rival producing areas is keener than ever before. The whole economic tide is against an increase of European demands and high prices for American foodstuffs in the immediate future. The solution of the farmer's ills must therefore be sought in internal readjustments to a changed world situation."

*Recent studies by the institute include "Germany's Capacity to Pay;" "Sugar in Relation to the Tariff;" "Miners' Wages and the Cost of Coal;" and "Russian Debts and Russian Reconstruction."

* * *

Resale of the Canton Arsenal

AN interesting story comes from Canton concerning a protest lodged on May 31 with the American consul at that port against the proposed removal of the arsenal plant sold to the Canton government a few years ago and its resale to some North China *tuchun*. On June 1 the Canton government issued the following *communiqué* in explanation of its position :—

"A protest has been lodged with the American consul here against the removal of an arsenal plant, bought through th American firm of James Rabbitt, from Canton, and its sale for the manufacture of arms in North China. This plant is government property; it was sold to this government

(Continued on page 323.)

Japan's New Diet Building to be the Centre of a Group of New Structures to house the Foreign, Home, Education, Agriculture and Commerce and Navy Departments

Japan's Reconstruction Program

NOTWITHSTANDING the huge imports of structural material into Japan the real work of reconstruction in that country has not yet started. The increase in the volume of importations of building materials following the catastrophe of last September came to an end with the removal of the temporary import duty on a long list of articles on April first. These materials were imported largely to meet the urgent requirements of housing, feeding and clothing the destitute people, an abnormal situation having no relation to the more important reconstruction program.

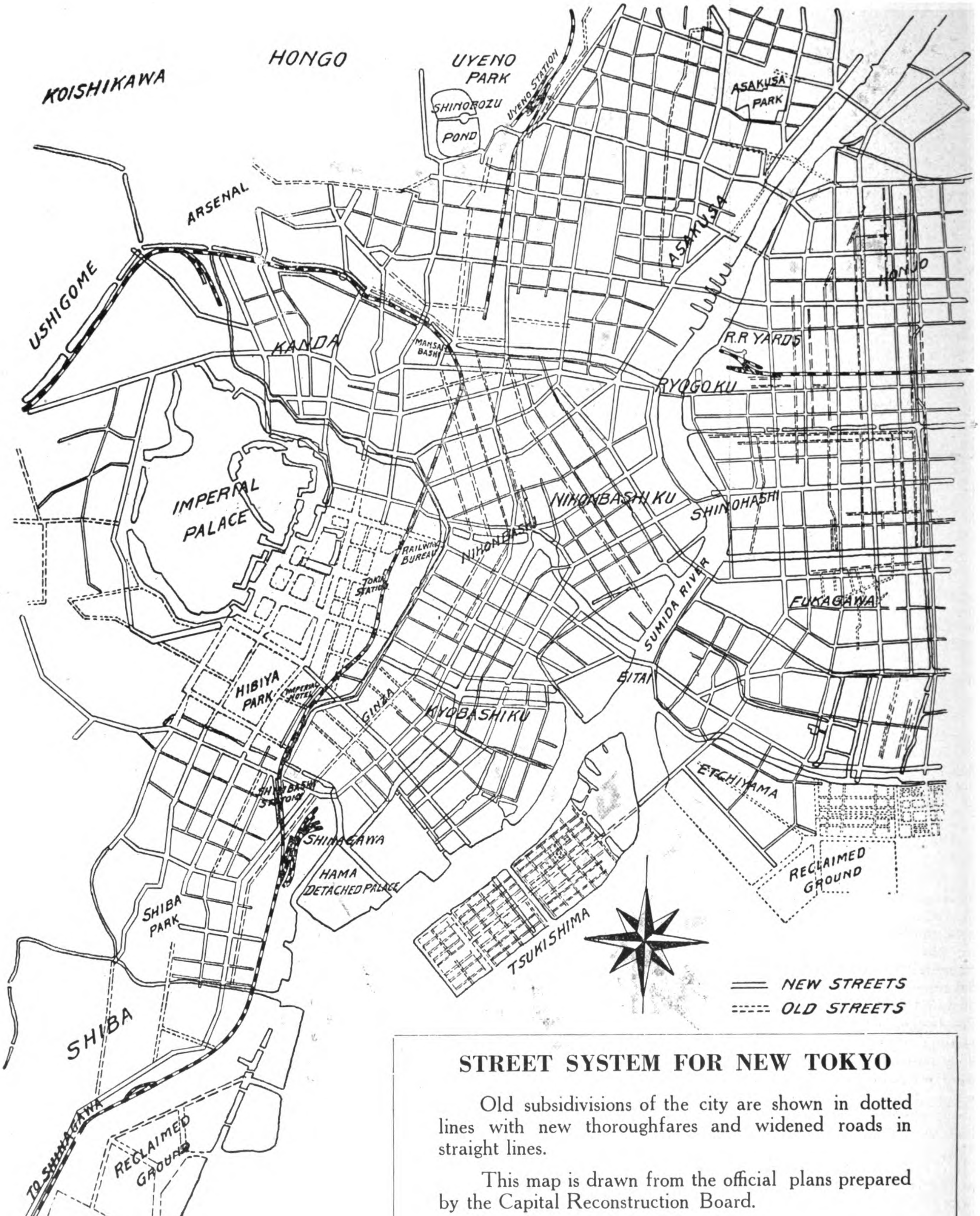
The real trade in reconstruction materials will begin after the commencement of permanent building operations in August. To carry out the comprehensive plans already drawn up for new buildings, streets, sewers, water and harbor works, transportation facilities, telephone systems and other improvements, huge quantities of materials will have to be imported. The work of devising plans for the rebuilding of a national capital on the ruins of an old city is not an easy one. The question of land readjustment and values is particularly difficult. The government proposes to pay for condemned land 90 per cent. of its appraised value, to be determined by a special committees elected from each of the 66 districts in Tokyo. This in itself will occupy the best part of the present year. The work of reconstruction entailing the laying out of a complete new street system with provisions for new canals, underground elevated and surface tramlines, government administrative centres, parks, markets, fire zones, bridges, sewers and all the other complicated engineering features of a modern city calls for plans looking far into the future needs of the city. Only a small part of the actual survey work on these plans has been completed.

The Central Tower and Main Entrance to Japan's New Diet Building

Most of the more important new building construction will be confined within a fire-proof zone which includes the Marunouchi, Kyobashi and Kanda districts.

Within this area the government proposes to subsidize the erection of fire-proof buildings to the extent of Y.50 per *tsubo* of floor space, or one-half the additional expense over wooden construction. The costs of wooden buildings is estimated at Y.200 per *tsubo*, while fire-proof construction is placed at Y.300 per *tsubo*. This subsidy will undoubtedly be taken advantage of by the majority of building operators and provide a large market for high-class building materials and hardware.

The street building program is to be completed within five years



STREET SYSTEM FOR NEW TOKYO

Old subsidivisions of the city are shown in dotted lines with new thoroughfares and widened roads in straight lines.

This map is drawn from the official plans prepared by the Capital Reconstruction Board.

and all streets over 18 *ken* in width are to be paved. The character of the pavement, however, will not be decided upon until experiments have been carried out with asphalt, wood and stone blocks. It will probably be another six months before any actual paving work on the new program will be started.

The amount originally stipulated for the use of the reconstruction bureau was Y.700,000,000, but the diet in December reduced the budget to Y.464,000,000, but provided that the government would add to this Y.106,000,000 in case the municipal governments took over a certain proportion of the street building. This the municipal governments have since indicated their willingness to do. Two-thirds of the money for the purpose will be supplied by the government and the other third will be loaned the municipalities for 30 years, the first five years without interest.

Even then the reconstruction bureau's resources fell Y.105,000,000 short of its requirements. A supplementary budget for this amount was to have been presented to the diet by the Kiyoura cabinet, but the dissolution of the lower house on the first day of the session, January 31, occurred before any business had been transacted.

The current expenses of the reconstruction bureau have been paid this year from a fund authorized by the Kiyoura cabinet on its own responsibility. This amount, a little more than Y.2,000,000 will be deducted from the supplementary budget for the bureau's use which will be submitted to the diet in its next session. If the supplementary budget is approved, the bureau will have the use of practically the entire amount originally recommended for its use.

A recent special number of *The Japan Times* gave the latest official information on the details of the reconstruction program and we are indebted to this source for the map of the street plan and the interesting information which follows:

New Street Plan

At first a sprawling village on the banks of the Sumida River; with numerous villages surrounding it. The city of Tokyo grew to its present size as one after another of these villages was absorbed, with its own street system, developing into a city with streets like a tangled spiderweb, rambling main roads, winding side streets and a hundred thousand narrow, crooked lanes and byways.

Cutting through this tangle, four broad thoroughfares are to be driven, from east to west and from north to south. One will cut through the heart of the city, starting from Yatsuyama, in Shinagawa, and passing through Shiba-guchi, on the east side of Shimbashi, will parallel the famous Ginza. Straight across the city to Uyeno this thoroughfare will go past Edobashi and Kurumazaka, terminating at Minowa.

Wide Thoroughfares

The width of this thoroughfare will vary in the various sections of its entire 13.470 metre length. The Shinagawa-Honshiba section of 3,360 metres will be 33 metres wide, increasing to 36 metres in the Honshiba-Shibaguchi section and to 44 metres where it traverses the main section of the city between Shibaguchi and Kurumazaka. From thence to the terminus the width drops back again to 33 metres.

The second main thoroughfare, one of 6,200 metres in length, will start from the foot of Kudan hill and run in a straight line to Ryogoko bridge, and from thence to Kameido. From Kudan to Jimbo-cho this road will be 33 metres wide, increasing by two metres between Jimbo-cho and the Sumida at Ryogoku bridge, with a lessened width of 27 metres in its distance on the lower side of the river.

A 33-metre street will run from Gofukubashi to the Eitai bridge, across the river and to Sunamura, a total distance of 5,250 metres.

Hibiya to Tsukiji

The fourth main thoroughfare to be driven across the city starts at the northeast corner of Hibiya Park, to Sukiyabashi and Owaricho, on the Ginza, and thence to the reclaimed land at Tsukishima. This is the shortest of the main roads, 2,270 metres, but it will be one of the most useful. From Hibiya to Kobikicho, the greater part of its length, this road will be 36 metres wide, decreasing to 33 metres in Tsukiji and from the site of the Honganji temple to its terminus the street narrows again to 27 metres.

A fifth road, of 33 metres for its entire length of more than 8,000 metres, starts at the Tsukiji Honganji temple, connecting the main street from Hibiya with the main Shinagawa-Minowa street. This road will traverse the busy section along the Sumida through Kayaba-cho, Hama-cho 3-chome and, turning to the north, will pass the west side of Asakusa Park and meet the Shinagawa thoroughfare at Kanasugi Shitamachi.

Uyeno to Oshiage

The sixth new street for main traffic starts from Uyeno Park and cuts the Shinagawa thoroughfare at Kurumazaka, proceeding thence to the Sumida, which it strikes in line to be driven to the electric car station of the Keisei line at Oshiage. This road, of a width from end to end of 33 metres, will have a total length of 3,064 metres.

These six are to be the main streets of the new city, supplementing the former main thoroughfares. In addition, less important new streets to the number of 122 are to be on the new map, these new streets to have a minimum width of eleven metres.

Tokyo Harbor

Tokyo's heretofore neglected harbor is to be improved and made available for ocean-going vessels, at an estimated cost of Y.28,700,000, and connecting all points throughout a large part of the city with the harbor there is to be created an enlarged barge-canal system. With the completion of this work, freights in and out of Tokyo can be handled at a minimum cost, with cheap water transportation from steamer to warehouse

The plans for the improvement of the harbor have not been fully worked out, and their execution will not be completed for five years.

Roughly, the plan is to dredge the mouth of the Sumida to a minimum low-tide depth of between six and a half and seven metres, with a retaining wall of the same depth. From the mouth of the river to a point near Daiba a 7-metre canal will be dredged, permitting the passage of ships up to 3,000 tons, while at Daiba dredging and reclamation work will provide room for docks and warehouses. From the Daiba reclaimed ground a breakwater with a total length of 3,750 metres will be built, while the retaining wall along which ships will tie up, will have a water depth of 7 metres for 1,800 metres and of 6½ metres for the remaining 270 metres of its length.

Off the present Omori flats, an area of 1,090,000 *tsubo* will be reclaimed, to provide ground for a great freight depôt.

Tokyo-Yokohama Canal

A plan, still further in the future, is the dredging of a barge canal to connect Tokyo and Yokohama, to be completed by 1929. The estimated cost of this new waterway is Y.17,800,000. The route practically parallels the beach line, with one terminus in Yokohama harbor and the other in the Sumida River at Shinagawa.

Its length will be 17,000 metres, with a width of 200 metres, and a minimum depth of 3½ metres.

Yokohama Harbor Works

Over two million yen has already been spent on reconstruction work in Yokohama harbor and the port has once again normal facilities. Four quays have been reconstructed; the breakwater, which sank at places below the water level, has been repaired, and steady work is under way to complete two more quays immediately and the rest, seven in all, by the end of March, next year.

A total appropriation of Y.4,843,961 has been made available for this work, and, if this should prove insufficient, a further expenditure is to be authorized at the forthcoming session of the imperial diet. The necessity not only of reconstructing this most important harbor but of increasing its capacity and facilities is fully recognized.

The first appropriation for harbor work was for Y.2,500,000, to cover the repairs of the wrecked No. 1 and No. 2 quays and the restoration of Nos. 4, 9, 10 and 11. The item also covered the extension of the foundations of No. 5 and the repairs to the breakwater.

For the present fiscal year, Y.2,087,190 has already been expended, while work to be carried on between now and the end of August calls for the expenditure of an estimated Y.4,411,585.

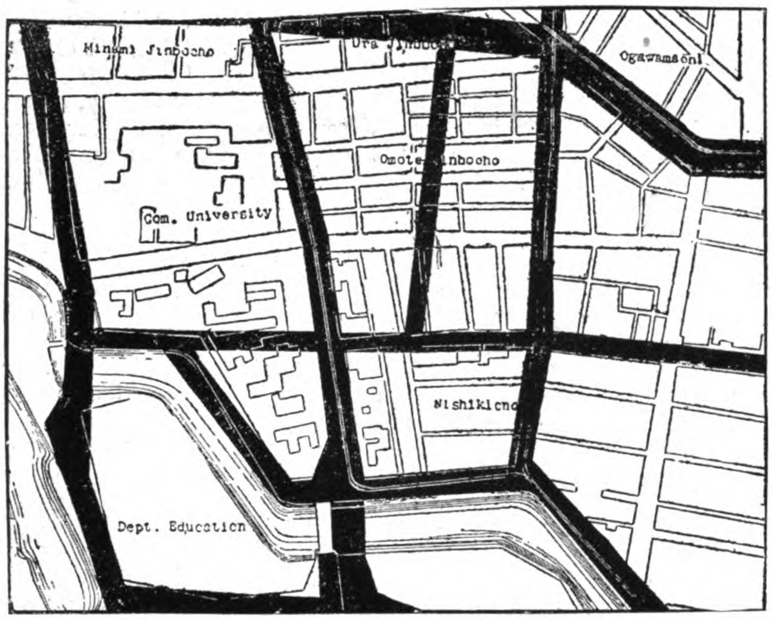
Quays No. 9, 10 and 11, as repaired, are solider than before the bottom dropped out of things in the quake, while each has been lengthened 48 feet seaward. Nos. 4 and 7, while left the same length as before, have been materially strengthened.

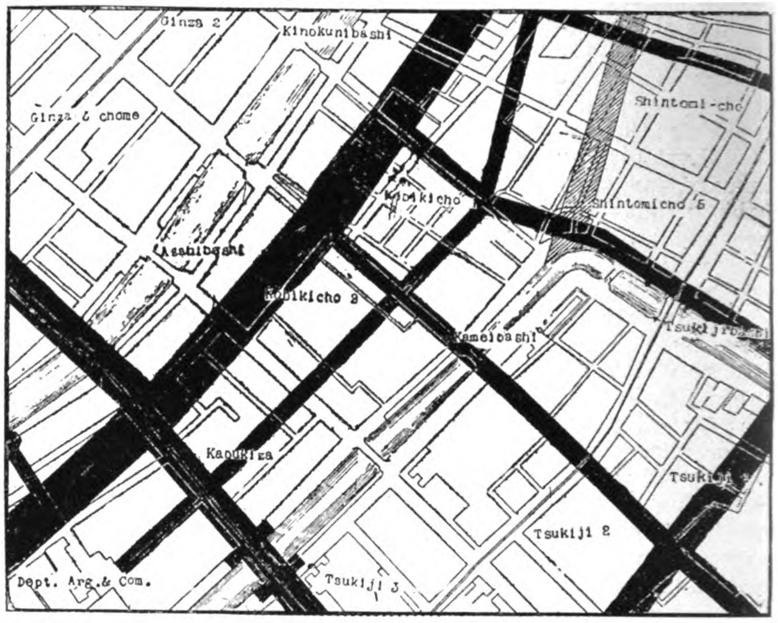
Quays Nos. 3, 5 and 8 are so badly shattered as to require complete rebuilding, and this is the part of the reconstruction work that will take until late next year to complete.

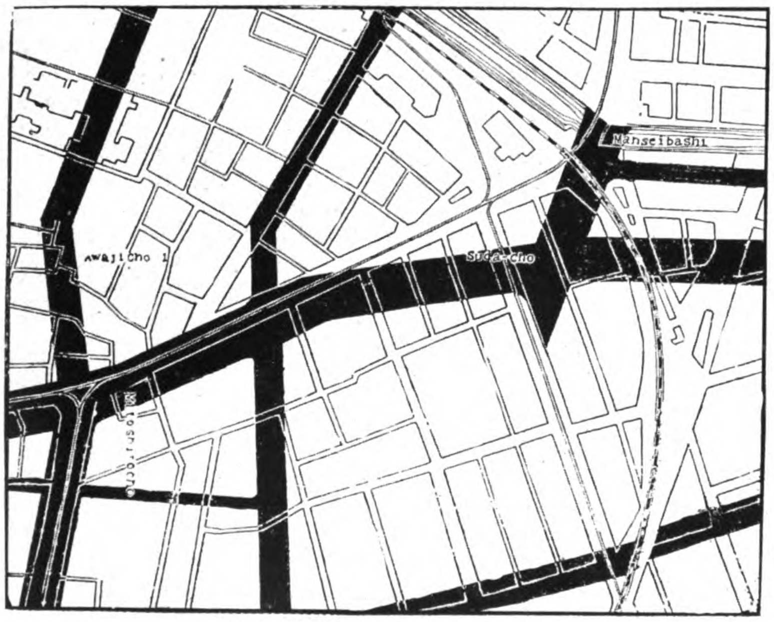
TOKYO'S NEW STREET PLANS

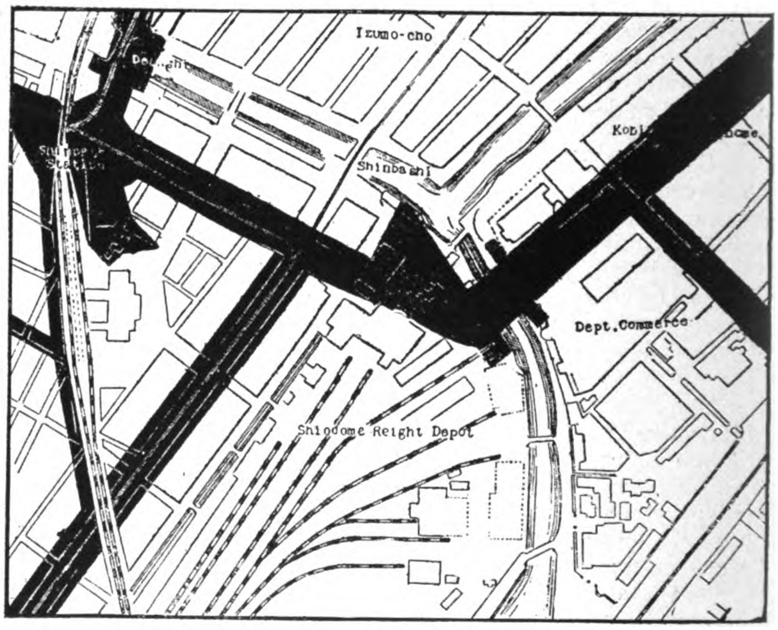
Street improvements in main centres: These detail maps show in black how thoroughfares will affect the various main centres of the city. The maps are self-explanatory, the new streets being superimposed upon the map of the streets as they at present exist.

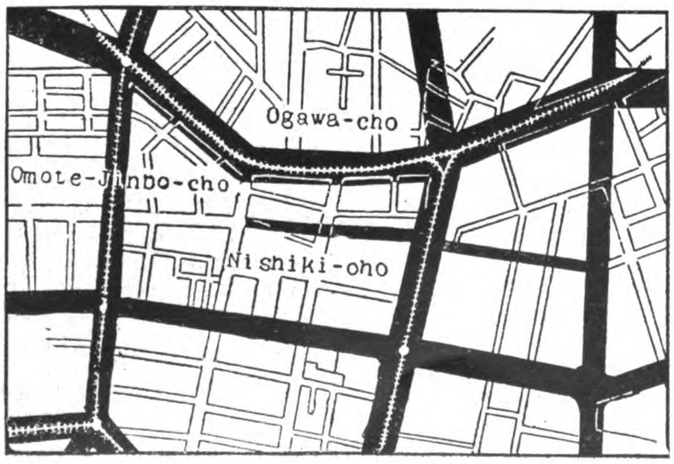
(From Japan Times)

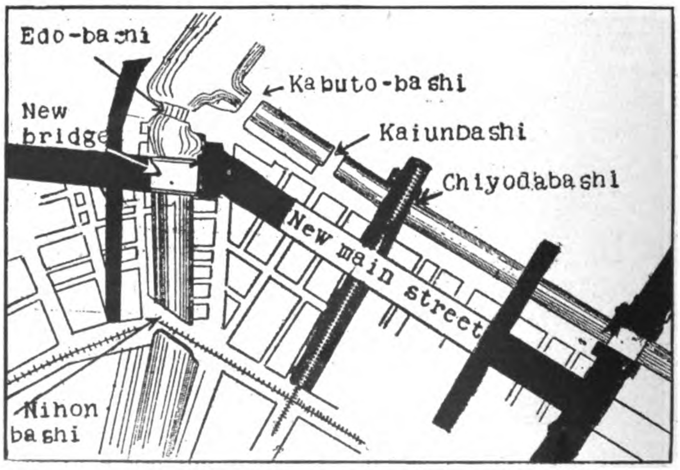


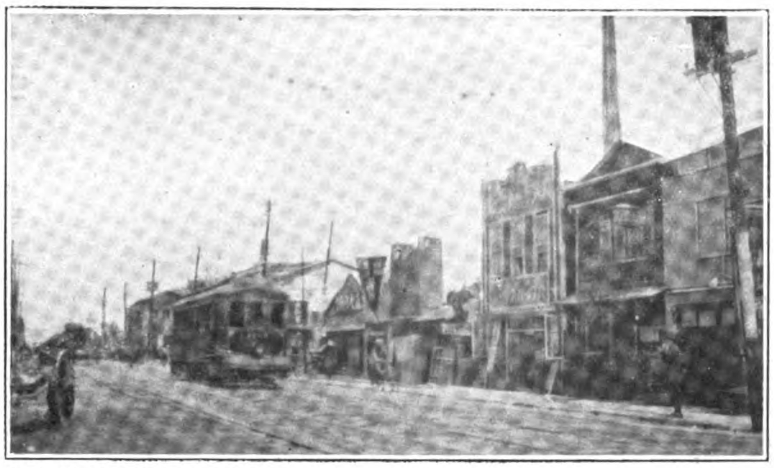












Typical Temporary Structures in Tokyo Built After the Earthquake

Tokyo Canal System

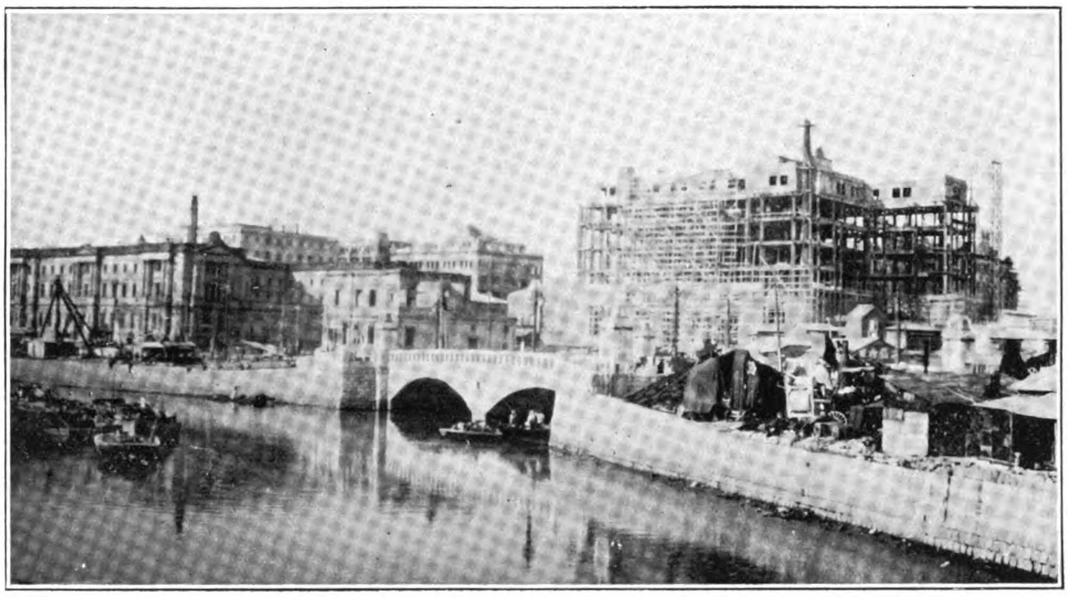
Tokyo, a city of waterways, will in the course of its reconstruction greatly elaborate and improve these important means of city communication. One who has paid no particular attention to the traffic on Tokyo canals will be surprised at the enormous quantity of goods transported by canal boats.

With the proposed harbor construction of Tokyo and the new canal projected between Tokyo and Yokohama, the Tokyo waterways system which has always been inadequate will be improved by the construction of a new canal commencing from the bay at the north side of the Shiba detached palace and extending to Shimbashi, passing to the north-west of the Shiodome railway freight station. At Shimbashi it will join the present canal which will be enlarged to a width of 33 metres throughout as far as Kabutobashi near the site of the Tokyo exchange.

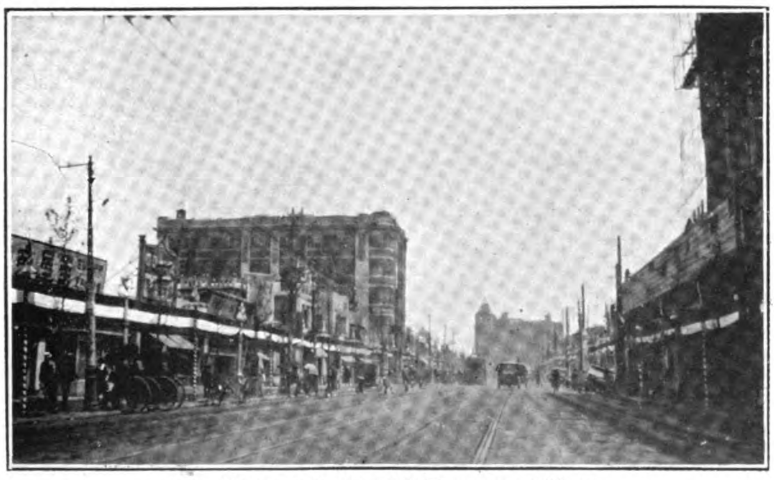
A second canal will be constructed from the Shiba detached palace to run through the east portion of the city to the mouth of the Sumida River. From a point on the Sumida near the Tokyo bay steamship office location a canal of 33 metres wide will be constructed extending to Yurakubashi. A canal 47 metres wide will extend from Eltaibashi via Reiganbashi to join the present canal near the bank of Japan. A canal 40 metres wide will be constructed starting at the west end of Etchujima to run eastward as far as Susaki.

The widest canal, 55 metres wide, will be built from the Sumida River near the place occupied by the Asano Cement Company to Oshima in Tokyo-fu. Another new canal 40 metres wide is to extend from Sunamura in Susaki to Yanagishimabashi near Keisei electric car station at Oshiage. The eighth new canal will be 47 metres wide extending from Ryogokubashi to Manseibashi. All of these new canals as well as the repaired old canals will have a water depth sufficient for the floating of vessels from 100 to 150 tons displacement. The banks will be so constructed as to allow the erection of large warehouses close to the water.

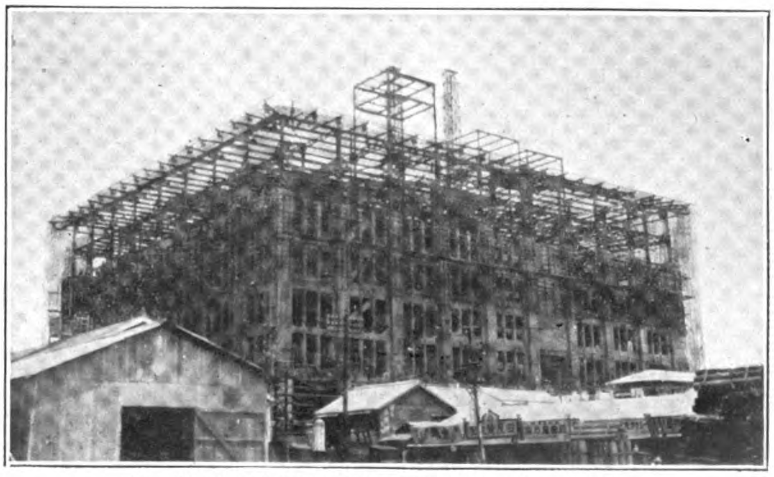
The entire waterways scheme requires an expenditure of Y.30,000,000.



Building Progress in the Heart of Tokyo's Financial District: Bank of Japan on the left. In the centre will arise the new Mitsui Buildings.



The Ginza, Rebuilt with Temporary Shops



New Steel Building in Course of Erection in Tokyo

New Bridges

The September disaster showed the necessity of more bridges spanning Tokyo's numerous canals, as well as the importance of having their structure fireproof. The bureau of reconstruction has decided on an ambitious program, necessitating the expenditure of nearly Y.80,000,000 for the construction of 218 new bridges of which 118 are to be constructed under the supervision of the board and the remaining 100 under the direction of the municipal government. The four bridges spanning the Sumida River, Azumabashi, Aioibashi, Ryogokubashi and Eitaibashi are to undergo such repairs and improvements as to render them safe under any circumstances.

The following new bridges have already been decided on to start the bridge building campaign: *Yamanoshiku bridge*, 145 metres long and 22 metres wide, to span the Sumida River near the point where the Takeya ferry is located at Mukojima. It is part of the new Sumida Park project.

Komagata birdge, 150 metres long and 33 metres wide, to span the Sumida half way between the present Azuma and Umaya bridges.

Kuramae bridge, 160 metres long and 27 metres wide, to span the Sumida half way between Umayabashi and Ryogokubashi, serving as an integral part of the new highway between Kameido and Honjo. It will be used both as a vehicle and a tramway bridge.

Nakasu bridge, 182 metres long and 22 metres wide, to span the Sumida half way between Shinohashi and Eitaibashi as a part of the new road from the present site of the Asano Cement Company to Nakasucho. This bridge will be the longest in Tokyo. Many of the present bridges are to be widened to conform with the new wide streets planned for Tokyo.

Sewer System

Plans are being prepared for a sewage system comparable with the best anywhere in the world. The new system had already been begun in Shitaya and Asakusa before the earthquake. The installation in Nihombashi, Kyobashi, Marunouchi, Kojimachi and Shiba will be completed in 1927. The total appropriation for this work is Y.43,500,000. In addition, Y.950,000 has been appropriated for general improvement of sanitation. This amount is to provide facilities for the disposal of garbage and similar purposes. The improvement and extension of the water supply system will cost Y.100,000,000.

Transportation Systems

Transportation within the new capital is a problem occupying many minds, the surface trams and the elevated lines having long been inadequate to meet the congestion at the rush hours. Transportation by an underground system has been much discussed, until at the present time three corporations are in the field, with ground to be turned by one or more of them within a short time.

Foreign, as well as many Japanese engineers, have taken borings all over the city and planned systems that are believed feasible in construction. Has it not been for the earthquake and the consequent loss of hundreds of millions, the work upon a subway system would have already been going on, but the plan has been checked, not stopped.

Present Tram Lines

There are at present 190 miles of surface tram lines in Tokyo· Under the new system, 16 miles of this will be abandoned and 197 miles more built, providing a system with a total trackage of 371 miles. In the new city, all roads with a width of 22 metres will be traversed with tram lines.

The railway lines in and out of Tokyo are all to be electrified, work upon the proposed change having been already well under way at the time of the earthquake. At present the electric line extends as far as Yokohama only, but work well on the way towards Yokosuka, via Ofuna, has been done with the intention of extending the electric service on the main line as far as Kozu by 1925.

Two Belt Lines

The lines within the city are to be completed, with both an inner and an outer circle. By the inner route, connecting Uyeno and Kanda stations, direct transfers from the Tokaido and Tohoku main lines will be possible. There are at present two tracks for trains and two tracks for electric cars between Shinagawa and Tokyo central. These tracks will be increased by an addition of another two lines for both uses while Uyeno station will be enlarged. When this is done ,then there will be a thorough line connecting Kyushu with Hokkaido which forms the spinal line of the imperial railway from the southern end to the northern terminal of the empire.

On the other hand, there will be two tracks each for electric passenger cars and freight trains on the present Yamanote line. All freight from Hokkaido for Tokaido and *vice versâ* will be transported through this elevated line. Tabata station in the line will become a transmitting points.

Under the new system of transportion, the present Tabata station on the Yamanote line will become a very important station as the termini of the Tokaido line while the Shinagawa station will be that for the Tohoku line.

The total expenditures for these improvements are figured at Y.22,000,000.

Automobiles Increases

The earthquake and lessened transportation brought an immediate demand for motor transport, with the result that a big increase in the number of automobiles has been recorded. Machines for freight and for hire at the end of August, 1923, numbered in Tokyo, for freight 488; for hire 1,638. These public vehicles had increased by March 31, in spite of the many lost, to 754 for freight and 2,621 for passengers. Private machines have increased by nearly three thousand, the figures being: private lorries and trucks before the quake 995; by the end of March last 1,736: private passenger cars before the quake 1,957; by the end of March 2,641.

Government Buildings

There will be a number of conspicuous changes in the New Tokyo that never would have been possible except for the opportunity the enforced rebuilding has given. One of the alterations that will bring the capital closer in line in appearance and convenience with those of other lands will be a grouping of the main national administration buildings, around the handsome new diet building, now well along in course of construction.

Administration Centre

Kasumigaseki will become the governmental centre. Here the towers of the diet building will mark the centre of a group of modern, handsome structures to house the departments of foreign affairs, finance, home affairs, education, agriculture and commerce, and navy all now, with the exception of the foreign office and navy department scattered in various parts of the city.

From the present site of the department of finance, an avenue 55 metres wide will run straight to the main entrance of the sites of what are now the garrison hospital and the bureau of aviation, to be run from a point near the British embassy and connecting with the main avenue.

Broad Parks

There will be broad park spaces throughout this district and the new structures will be built in relation to each other, to form one harmonious whole.

The new homes for the departments of home affairs, education, finance and agriculture and commerce will stand in the rear of what is now the department of home affairs.

A new building for the department of railways will be erected in front of the Tokyo central station, near the spot now marked by the Mayeshima statue.

Tokyo Station

Another of the conspicuous changes will be in the extension of the space included within the grounds of the Tokyo central railway station, which is to be doubled so as to include all the area now occupied as a site by the municipal offices.

A second main entrance for the station on the Ginza side is to be created, and from this entrance a new street will run to the 44-metre thoroughfare near Nihombashi.

The planned improvements in and around the main railway station, to be completed by 1928, will cost Y.5,000,000.

New Schools

Several very handsome school buildings are included in the reconstruction plans of the department. New homes for the first high school and the agricultural college of the imperial university will go up, exchanging their old sites.

University of commerce building will be built at Nerima-mura, near Itabashi, in the northern suburb, while the new Tokyo higher

technical school is to be at Senzoku-maru, near Osaki, beyond Shinagawa.

The old site of the girls' higher normal school is to be used for the foreign language school, but the selection of a new site for the normal has yet to be done

The many primary schools destroyed will all be rebuilt on their old sites, but the buildings will be both large and designed in more modern ways.

Larger Markets

A central wholesale market is to go up at Tsukiji 4-chome, to cover 90,000 *tsubo* of ground, while a new vegetable market is planned for Sakuma-cho, Kanda, to cover 10,000 *tsubo*.

The main fish market will be located at Tsukiji, to be connected with the main railway system by a spur, while the dredging of the Sumida and the new harbor work will connect the market directly by water with all the main sources of supply.

Central Postoffices

A new big building for the Tokyo central postoffice, which is now housed in a one-story barrack opposite Tokyo station, is to be constructed at a cost of Y.6,000,000. The new building, for which plans have already been made, will be five storied and be modeled after the London postoffice and the Chicago postoffice, which are among the most modern postoffices in the world. It is expected that the construction of the postoffice will require five years, and the building upon completion will be counted as one of the finest buildings in Tokyo.

New City Plan

In the plans for a new Tokyo, a segregation of industrial, business and residential sections is to be carried out, with types of buildings for each specified in the new building ordinance. A fairly complete park system, more breathing spaces for the population, playgrounds for the children and spots of safety from fires have been planned. Never again, if the city planners can prevent it, will there be enacted in Japan such a tragedy as took place in Honjo on September 1, when forty thousand men, women and children found themselves hemmed in by flames, trapped inexorably and with death the easiest and only way out.

Factories and Business

The factory section where the manufacturing plants will be concentrated, will be in the Honjo and Fukagawa wards east of the Sumida River.

The main business section—although there will be hundreds of smaller centres throughout the city, to serve the people—will be located in the area bounded on the east by the Sumida River, on the west by the grounds of the imperial palace, on the southwest by Iigura and on the northwest by a line drawn from Kudan to Iida-bashi, extending to Uyeno park, with the remaining north side extending to the limits of Asakusa ward.

The residential section, within which very many kinds of manufacturing and business will be strictly prohibited, will include all the Yamate, or high ground, and in those other sections of the city not included within the limits of the factory and business sections.

Many New Parks

All the old parks in Tokyo will be restored to their original condition as soon as it is possible to remove from them the many thousands of refugees, now living in temporary barracks, rushed up immediately after the fire.

In addition, the home department will co-operate with the municipality in increasing the number of parks, the location of the following having been decided upon already, with others to be set aside later :—

Kinshi-cho park, in Honjo, to occupy the site of the former Honjo provision and fodder warehouse ;

Sumida park, to take in the river frontage in the Mukojima section ;

Hifuku-sho park, the site of the former army clothing depôt, Honjo, the scene of the awful tragedy referred to above.

Fifty-two small parks in various sections of the city, near schoolhouses.

The parks being planned in addition to these are six, as follows :

Shitaya Takecho park, Fukagawa park, Kojimachi park (at Sanno) ; Koishikawa park, on the site of the old arsenal, and the Shiba park, on the site of the former imperial detached palace.

Three of these, the one in Shiba, the one on the Sumida and the one on the old arsenal site will be large and laid out elaborately.

Automatic Telephones

Out of a total 84,000 telephone subscribers, last August, there are now in service 28,000. This number will soon be increased to 64,000, when the Asakusa, Ginza, Hamacho and Sumida exchanges are restored. Fourteen of the eighteen exchanges in the capital were destroyed by the fire.

Half the new system is to consist of automatic telephone equipment, for which 50,000 automatic instruments have been ordered from England. The entire system eventually is to be equipped with instruments of the automatic type and their use extended to Yokohama next year. There were 10,000 telephones in the port city before the earthquake and 2,500 are operating now.

Resale of the Canton Arsenal

(Continued from page 316.)

by the said American firm for $1,600,000, and $1,200,000 has been paid, leaving a balance of about $400,000.

"The arrangement was that the plant should remain in a warehouse pending payment of the balance and charges.

"The American vendors, unwilling to continue this arrangement, have contracted to resell this plant through a Japanese intermediary, without notification to this government nor even arranging for repayment of the money already paid.

"A Japanese steamer is now in Canton with specially recruited laborers from Manila (Canton laborers having refused to handle the cargo) who have begun preparations to load the plant for shipment northward.

"The United States being a party to the arms embargo agreement, it is an interesting question whether the removal of the plant from Canton and its resale to other parties in China would not constitute a breach of the agreement by America, *vis-à-vis* the other signatoties. On the other hand, the retention of the plant in Canton could not be so construed, since the United States was not a party to the agreement when the plant was actually imported into Canton."

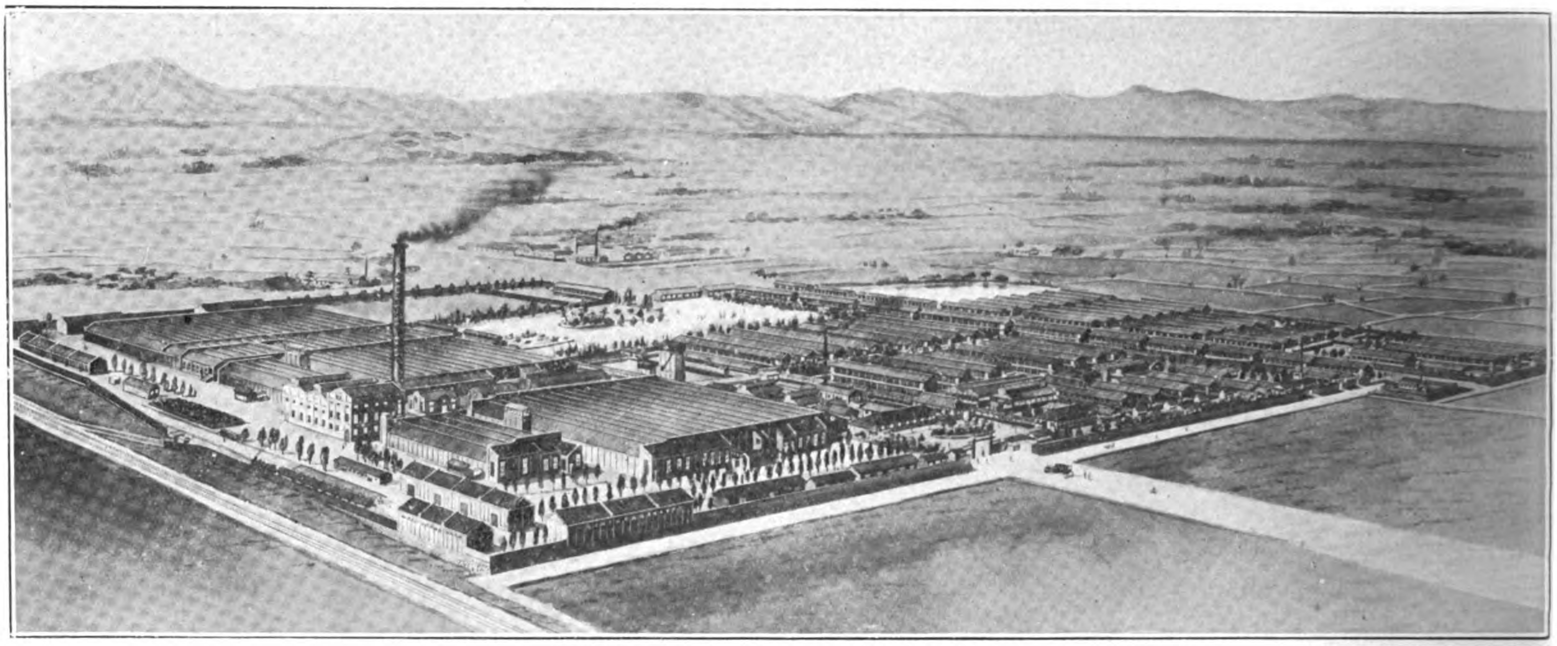
If the facts disclosed in the *communiqué* are true it would appear that the machinery never left the legal possession of the American firm, that all this time it has retained ownership over a very valuable munitions plant in China at a time when its government has placed an embargo on the export of arms to this country. According to the *communiqué*, the United States was not a party to the international arms agreement when the plant was actually imported into China, but the American authorities must have known that the arsenal was being held in the warehouse as American property awaiting full payment before being turned over to the Chinese purchaser. The Canton government having paid to date seventy-five per cent. of the purchase price has a very reasonable complaint if the munitions plant is now taken out of the bonded warehouse and sold to its enemies.

Tientsin Water Supply

(Continued from page 342)

The pumping machinery consists of high-lift and river water pumps, steam and electrically driven. The high-lift pumps are five units of Tangeye's treble ram steam pumps and two units of Sulzer centrifugal pumps coupled direct to electric motors. The river water pumps are even units of steam-driven centrifugal pumps, and two electrically-driven centrifugal pumps. Four of the steam pumps are at the Yu-ho end of the pipe line and three at the end of the Hsi-ho line. Boilers are three Babcock and Wilcox, three Cochrane and five locomotive. The pumping machinery develops a pressure of 150 feet.

The present water tower has a capacity of 100,000 gallons and gives a pressure of 110 feet. Another tower of 200,000 gallons is under course of construction. Water is taken from the Yu-ho and Hsi-ho through long intake pipes, pumping machinery being placed at the river end. Water is thus obtained from streams above the Chinese city and concessions, it being therefore, freer of drainage matter than water that has passed by this area, although just as full of suspended soil. The company has not deemed it expedient to explore the possibilities of artesian wells and has no intention to experiment while it can still obtain its present excellent supply. It is felt almost impossible to obtain anywhere near the demand from artesian borings, however satisfactory they may prove. The price of water to individual consumers is 70 cents a thousand gallons.



Ogaki Factory of Dai Nihon Boseki K.K.

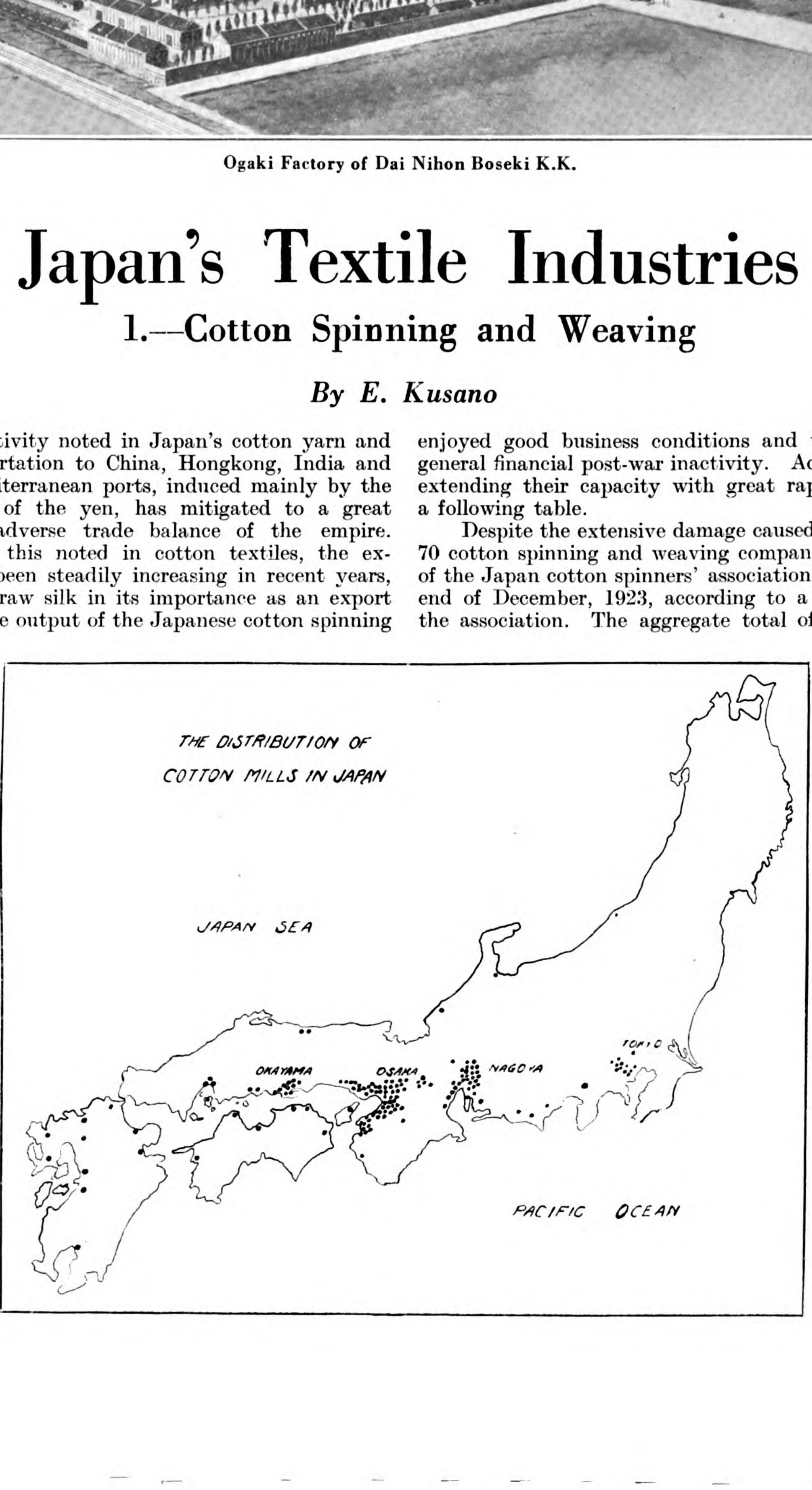
Japan's Textile Industries

1.—Cotton Spinning and Weaving

By E. Kusano

THE recent activity noted in Japan's cotton yarn and textiles exportation to China, Hongkong, India and even to Mediterranean ports, induced mainly by the depreciation of the yen, has mitigated to a great extent the adverse trade balance of the empire. Especially is this noted in cotton textiles, the exportation of which has been steadily increasing in recent years, and has become next to raw silk in its importance as an export commodity of Japan. The output of the Japanese cotton spinning and weaving mills in the Kanto districts was seriously impaired as a result of the earthquake but thanks to speedy reconstruction work, the manufacturing capacity has been restored to a large degree.

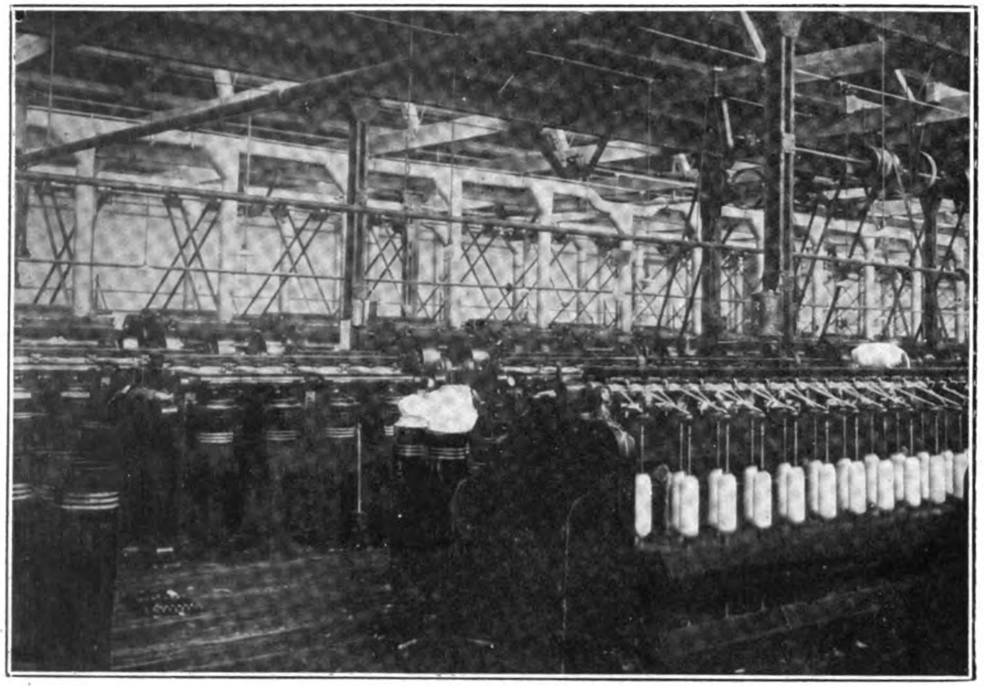
The cotton yarn and weaving industry in Japan was one of the few which survived the reactional panic after the European war. The Kanegafuchi Cotton Spinning Company, for instance, has maintained its semi-annual 70 per cent. dividends until the first half of 1923; the company, then reduced its dividend rate to 60 per cent., for the last half of 1923, because of the quake. The other spinning and weaving companies, with few exceptions, enjoyed good business conditions and were not affected by the general financial post-war inactivity. Accordingly they have been extending their capacity with great rapidity, as will be seen in a following table.



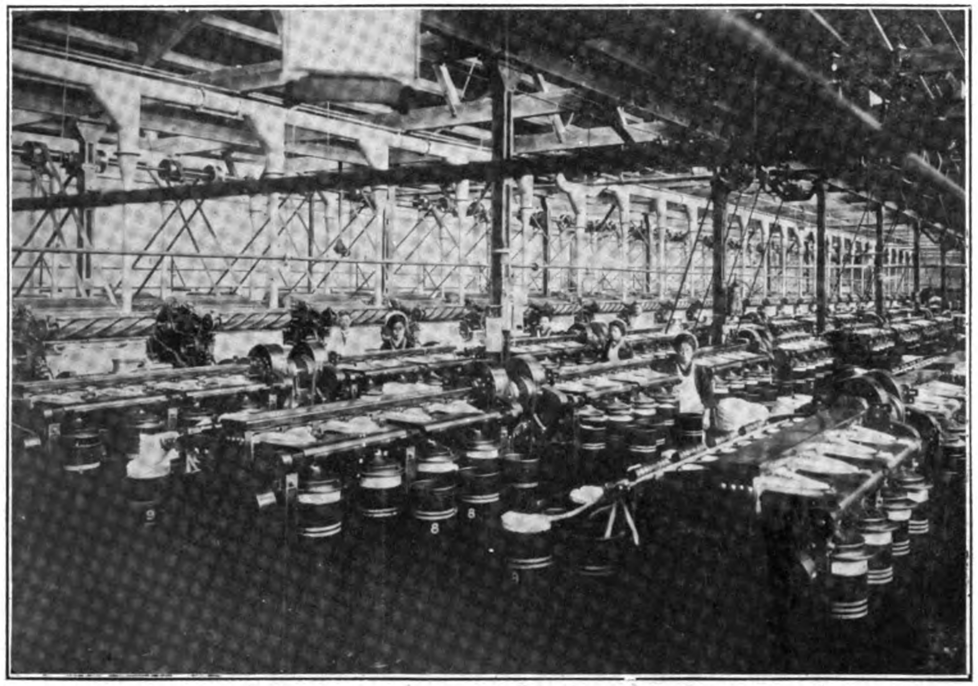
Despite the extensive damage caused by the quake, there were 70 cotton spinning and weaving companies, including 60 members of the Japan cotton spinners' association, and 10 outsiders, at the end of December, 1923, according to a report just published by the association. The aggregate total of the authorized capital of these 70 companies amounted to Y.530,277,650 and of this Y.372,272,935 was paid up, the reserves reaching Y.217,407,890. The number of spinning and weaving mills stood at 241, of which 228 belonged to the members of the association; operating 4,422,428 ring spindles, 14,370 mules; and 510,031 doubling spindles. Of these the members of the cotton spinners' association operated 4,183,596 ring, 14,370 mules and 501,031 doubling spindles, leaving 238,832 ring and 9,000 doubling spindles operated by non-members. There were 64,460 looms in operation, of which 61,421 belonged to the members of the association.

Compared with pre-earthquake conditions

The Ogaki Factory of the Dai Nihon Boseki K.K. (Japan Cotton Spinning Company)

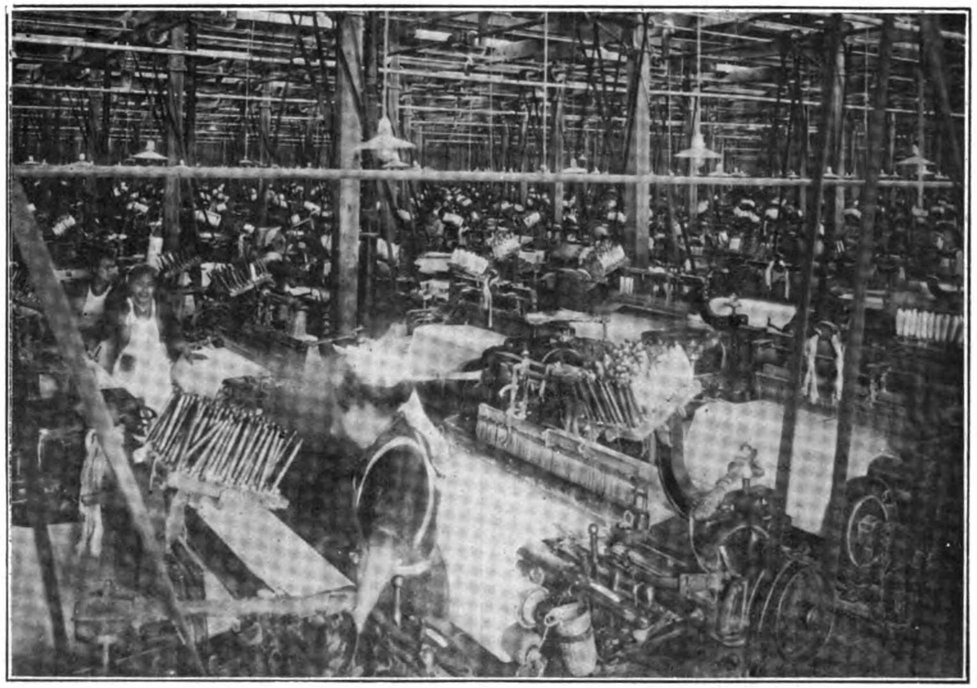


Slubbing Room



Platt Bros. & Co., Ltd. Carding Machines

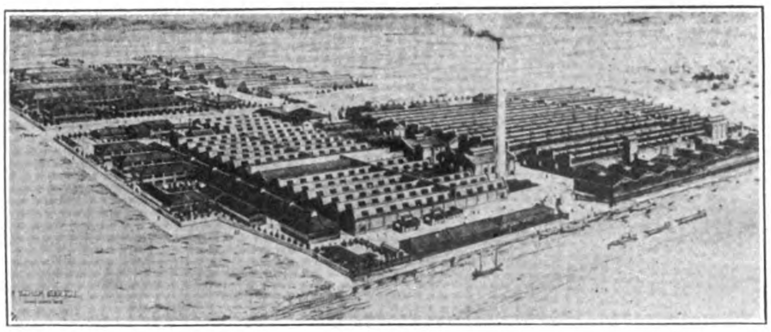
Packing and Baling Yarn for Export

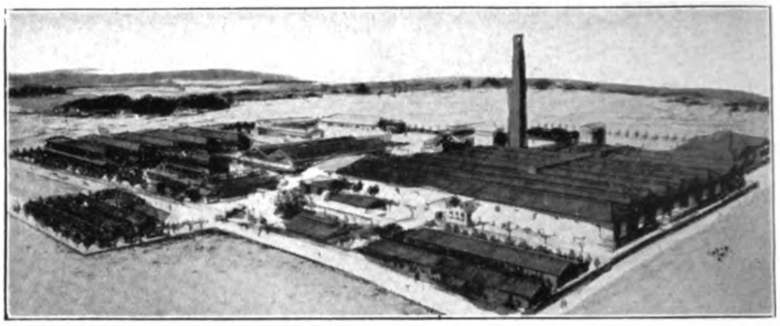


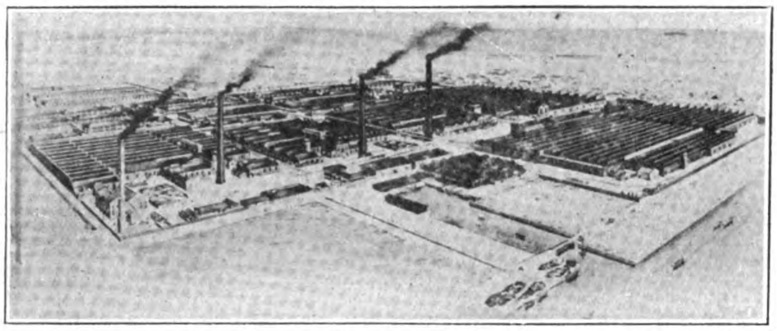
Weaving Room

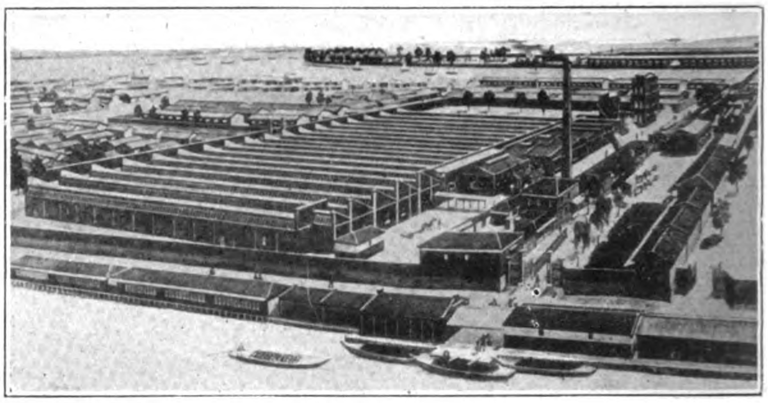
Eight Mills of the Toyo Cotton Spinning Co., Ltd.

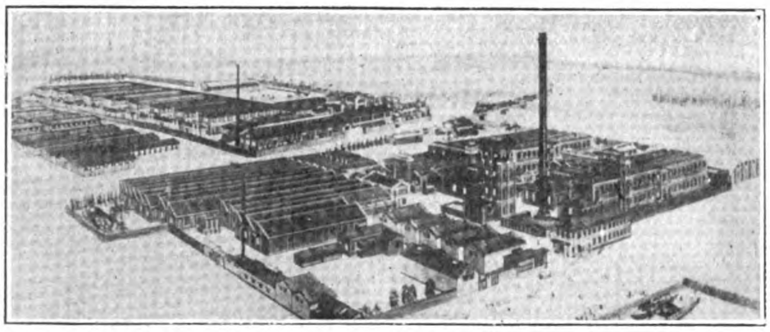
This Company Operates 21 Mills and Has 45,000 Employes

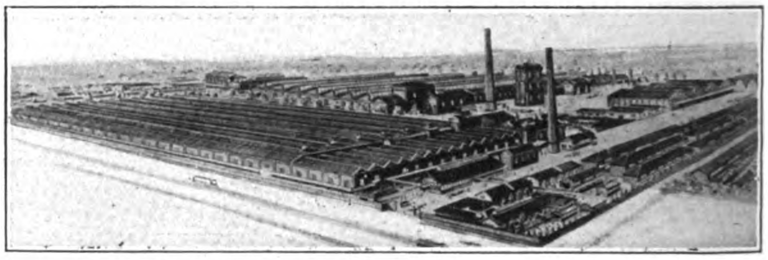

Oji Factory

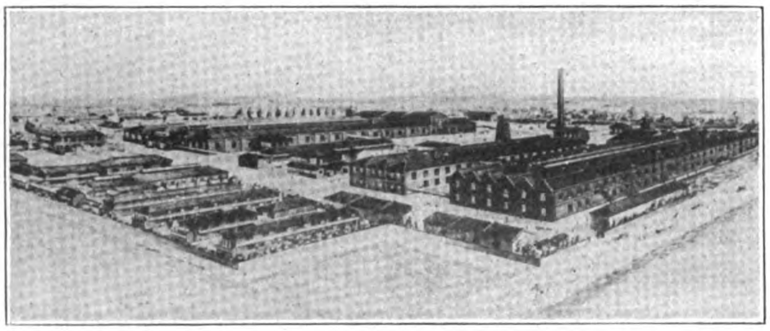

Kuribashi Factory

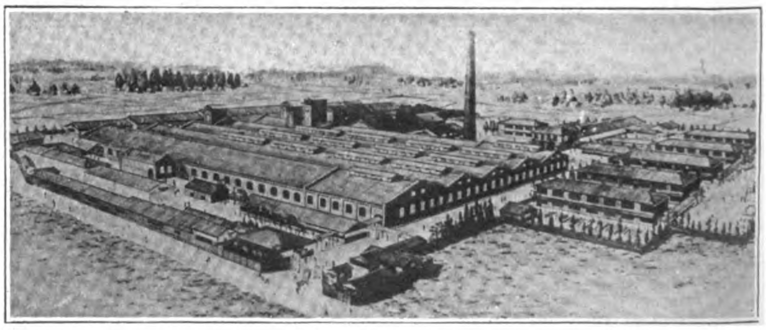

Tsu Factory


Nishinari Factory


Yokkaichi Factory


Aichi Factory


Nagoya Factory


Tsushima Factory

of June 30, 1923, the number of ring spindles operated by members of the association registered a decrease of 435,350, while mules declined from 48,470 to 14,370, a loss of 34,100. The Kanegafuchi Cotton Spinning Company, with 94,504 ring spindles at its principal factory in Tokyo at the end of June, 1923, had only 72,568, at the end of the year. The Fuji Gas Spinning Company, with three factories in the Kanto district, at Koyama-machi, Shizuoka prefecture, Kawasaki-machi, Kanagawa prefecture, and Oshiage-machi, Honjoku, Tokyo, lost something like 307,440 ring and 31,600 mule spindles. The company's doubling spindles dropped from 107,436 to 19,816.

The decrease in looms was comparatively small, from 62,205 to 61,421 excluding the number of looms owned by non-members of the association.

During the past 20 years, the number of ring spindles registered a steady increase, while mules decreased. On June, 30, 1903, there were 1,288,706 ring which increased to 4,618,946 at the end of June, 1923. Mules, fell away from 91,260 to 48,470 in the same

period. The following table tells of the progress made by members of the cotton spinners' association during the last ten years:—

Years.	Spindles. Ring	Mule	Doubling Spindles	Looms
1913	2,365,094	49,405	320,812	24,224
1914	2,606,004	51,170	348,766	25,443
1915	2,754,124	53,390	355,318	30,065
1916	2,825,944	49,960	370,681	31,293
1917	3,008,568	51,910	383,458	36,181
1918	3,175,763	51,910	384,872	36,181
1919	3,435,932	52,330	410,690	40,391
1920	3,761,250	52,330	466,460	44,401
1921	4,116,616	44,510	533,334	50,583
1922	4,472,112	45,500	602,032	60,756
1923	4,183,596	14,370	501,031	61,421

Production statistics are set forth in the following table:—

Items.	December, 1923	December, 1922
No. of Companies	55	61
Working spindles:		
Ring	3,934,926	4,022,139
Mule	29,553	42,376
Total	3,964,479	4,064,515
Working days	156.5	156.0
working hours per day	18.50 hours	21.00 hours
Average count of yarn:		
Ring	20:9s	20.4s
Mule	35s	26.7s
Yarn produced		
Ring	51,066,627 Kan	55,219,718
Mule	172,944 „	269,978
Total	51,239,571 „	55,489,696
Average per day per spindle production:		
Ring	84.5 *monme*	93.2 *monme*
Mule	48.6 „	35.4 „
Cotton Consumed	58,609,499 *kanme*	63,570,309 *kanme*
Output of cotton fly	7,118,007 „	7,554,898 „
Output of waste yarn	387,208 „	502,852 „
Coal consumed	621,458,432-lbs.	706,612,119-lbs.
Average price of coal, per 10,000-lb.	Y.71.73	Y.70.58
Actual power used per day—steam	53,702 h.p.	61,300 h.p.
Water, electricity & gas	77,058 h.p.	71,757 h.p.
Coal consumed per h.p. per hour	3.338-lbs.	3.318-lbs.
Daily average number of hands:		
Men	36,724	42,130
Women	119,911	135,431
Average wages per day:		
Men	Y.1,481	Y.1,537
Women	1,181	1,234

Consumption of Raw Cotton

(In *kanme* of 8.27-lbs.)

Years		Years	
1913	85,455,343	1919	107,706,459
1914	94,062,892	1920	102,277,957
1915	95,938,546	1921	103,265,619
1916	106,470,428	1922	125,745,569
1917	108,713,235	1923	122,364,316
1918	102,387,376		

The consumption of raw cotton during the latter half of 1923 amounted to 58,609,499 *kanme*, which was a decrease of 5,045,000 *kanme*. Of this total 38,071,898 *kanme* was Indian cotton, against 16,596,161 *kanme* of American cotton. Chinese cotton amounted to 1,513,886 *kanme*, against 1,586,537 *kanme* for the previous half year.

The semi-annual consumption of Chinese cotton, which went beyond 9,400,000 *kanme* in 1919, decreased abruptly to 120,530 *kanme* in 1921. But recent tendencies indicate a steady increase in imports of Chinese cotton.

Egyptian raw cotton in 1923 rose to 1,238,384 *kanme*. This was a decline of approximately 200,000 *kanme* from 1922.

Comparative statistics of raw cotton importations into Japan by countries are as follows:

Countries	1923	1922
British India	Y.263,026,162	Y.209,897,193
U. S. A.	177,550,743	178,808,772
China	39,221,014	28,521,188
French Indo-China	616,061	922,995
Africa	19,541,260	8,464,530
D. I. E.	209,278	615,510
Siam	34,929	——
Straits Settlements (F.M.S.)	820,257	523,760
Others	12,151,756	86,943
Total	Y.513,172,458	Y.427,840,891

When converted into bales of 300 *kin*, the importation of raw cotton during 1923 amounted to 2,930,506 bales against 2,877,886 bales for 1922. This increase is mainly due to overwhelmingly heavy imports of 1,997,901 bales during the first six months of 1923.

The production of cotton yarn in Japan has shown an unceasing increase, but its export, however, waned after the European war boom period, as seen in the following table of 300 *kin* bales.

Years	Production	Exportation
1914	1,666,184	596,990
1915	1,720,264.5	575,891
1916	1,925,579	547,147
1917	1,923,841.5	470,852
1918	1,803,666	421,512
1919	1,920,782.5	230,333
1920	1,816,976	304,925
1921	1,811,350	292,260
1922	2,228,246	394,062
1923	2,171,153	248,324

Except the temporary boom witnessed in April, May and June of 1922, when the monthly exportation of cotton yarn ranged from 46,000 bales to 84,000 bales, Japan's monthly sales abroad usually fluctuated between 12,000 bales and 32,000 bales. But in 1923, the exportation of cotton yarn from Japan decidedly increased. The monthly exportations, which had ranged from Y.4,000,000 to Y.6,000,000 jumped to Y.8,962,000 in March, 1923, and to Y.13,882,000 in April, 1923.

The activity of cotton yarn exportations from Japan is attributed to the (1) the depreciation of the yen, which made the price of the Japanese product the lowest in the world; (2) the cotton spinners' strike in Bombay, causing a decrease of supply in Hongkong and Singapore, and (3) the increased consumption of cotton yarn in China.

The exportation of cotton yarn by countries is shown as follows:

Countries	1923	1922
China	Y.38,503,001	Y.62,285,072
Hongkong	11,534,733	23,478,306
Philippines	771,632	910,275
Kwantung	3,881,021	5,891,325
British India	20,511,884	20,666,783
Asiatic Russia	54,255	53,460
D. E. I.	1,364,454	——
Others	1,890,981	1,538,034
Total	Y.78,511,961	Y.104,723,255

Japan imported 5,978 bales of cotton yarn during the last half of 1923, an increase of 5,624 bales, that period. The importation of cotton yarn into Japan has fluctuated rather widely, as seen in the following table, which also gives the domestic consumption of cotton yarn:—

Years	Importation	Domestic Consumption
1914	607	1,096,798
1915	588	1,449,615
1916	660	1,379,092
1917	1,004	1,453,893.5
1918	1 088	1,383,542
1919	8,907	1,699,356
1920	5,121	1,517,172
1921	2,579	1,521,569
1922	3,126	1,787,310
1923	6,332	1,929,161

Loans on raw cotton and cotton yarns by banks in Osaka and Kobe averaged for the last half of 1923 some Y.40,288,000 including Y.30,017,000 for a raw cotton. The loans made against the same commodities during 1922 were Y.18,057,000. This includes Y.8,777,000 loaned on raw cotton.

Cotton Textile Industry

During the latter half of 1923, 42 members of the association operated 52,626 looms, manufacturing 497,342,927 yards of cotton textiles. The average of working days period was 154 days, with 12.59 as the daily working hours. The per day, per loom output reached 53.23 yards. The consumption of cotton yarn by these companies was 120,001,910 pounds and the production of waste was 1,747,012 pounds. The average number of workers in textiles was 8,045 men and 40,306 women. The men's wages averaged Y.1.479 a day. Women workers averaged Y.1.185.

Compared with the first half of 1923, looms decreased 691, and the total production 6,024,038 yards. However, the number of looms in the last half of 1923 increased 407, over 1922, and the output was 52,872,939 yards greater.

Consumption of cotton yarn in the last half of 1923 declined by 976,155 pounds from that used in the first half of the year, but, compared with the corresponding period of 1922, it increased 20,174,542 pounds.

The annual output of Japan's cotton weaving industry is as follows:

Years	No. of looms	Production (Yards)	Yarn Consumption (pounds)
1914	49,822	504,901,674	123,863,966
1915	55,374	512,016,621	124,632,631
1916	60,220	560,210,103	136,413,408
1917	63,840	594,649,419	142,770,758
1918	72,789	656,935,420	160,301,569
1919	82,789	738,955,766	179,898,560
1920	89,270	761,037,360	189,651,320
1921	88,218	700,697,985	176,527,501
1922	102,065	889,327,652	213,327,505
1923	105,943	1,000,708,890	240,979,975

The importation of weaving machinery into Japan during the latter half of 1923 was valued at Y.829,029, an increase of Y.322,-576. The total importation in 1923, which amounted to Y.1,335,482 was an increase of only Y.2,142 over 1922.

Japan's exports of cotton textiles during the latter half of 1923 showed an increase over the first half of the year. Yearly exportations to various countries follow:

Countries	1923	1922
China	Y.100,292,315	Y.108,757,781
Kwantung province	14,617,573	18,494,039
Hongkong	11,625,461	10,212,743
British India	36,546,103	33,567,336
Straits Settlement	6,048,085	5,892,104
D. E. I.	22,534,624	24,938,051
French Indo-China	26,334	115,090
Asiatic Russia	685,830	1,094,905
Philippines	5,398,857	345,260
Siam	1,432,448	1,362,544
Britain	5,791	48,870
United States	2,503,531	4,125,990
Argentine	1,221,876	——
Africa	14,613,675	1,508,652
Australia	6,064,102	6,290,925
New Zealand	467,726	633,819
Hawaii	419,285	321,637
Others	9,240,584	474,743

The importation of foreign cotton textiles into Japan, during the latter half of 1923, amounted to Y.3,788,043, an increase of Y.248,381 over the first six months of the year. Compared with the corresponding period of 1922, there was a decline of Y.1,144,594. The following table sets forth the annual importation of foreign cotton textiles:

Countries	1923	1922
Great Britain	Y.6,843,359	Y.12,882,491
United States	231,191	475,533
Other countries	203,155	211,677
Total	Y.7,277,705	Y.13,569,701

The monthly exportation of cotton textiles has registered a steady increase especially since February, 1924, when the value of yen in the international money market started to decline. Japan exported something like Y.94,790,000 worth of cotton textiles during the first four months of this year. This showed increases of Y.19,000,000 and Y.24,000,000 as compared with 1923 and 1922.

The Dai Nibon Boseki K. K. or the Japan Cotton Spinning Company Ltd., was established in June, 1889. The present authozied capital amounts to Y.51,000,000, all paid up. The company held reserves amounting to Y.30,000,000 at the end of December, 1923. This company has 12 factories; four in Osaka prefecture, three in Hyogo prefecture two in Nara prefecture, one each in Tokyo, Gifu and Aichi prefectures. Its head office is at 3 chome Bingo-machi, Higashi-ku, Osaka. The total capacity is now 572,870 spindles (560,480 ring and 12,390 mule) in addition to 153,728 doubling spindles. Looms of this company are 5,516.

Among other factories, the Ogaki factory, illustrations of which are shown, is situated in Ogaki city, Gifu prefecture. It has 44,672 ring spindles and 1,188 looms. The Tsumori factory of the company, which is in Nishi-Nari gun, Osaka prefecture, has 62,668 ring spindles, the largest number among the 12 factories. There are 14,280 doubling spindles and 1,678 looms at this factory.

The Toyo Boseki K. K. or the Oriental Spinning Company, which is another of Japan's larger cotton mill operators, was established in June, 1913. The authorized capital is Y.50,600,000 of which Y.31,850,000 is paid up. The reserves are Y.35,995,335. This company has 18 factories, with 582,288 ring, 44,628 doubling spindles, and 13,135 looms. The head office of this company is at 2 chome, Dojima Hamadori, Kita-ku, Osaka.

The Kanegafuchi Boseki K. K. (The Kanegafuchi Cotton Spinning Company), which is Japan's champion cotton mill, was established in May, 1887. The authorized capital was Y.18,127,650 at the end of December, 1923, of which Y.16,486,970 was paid up, the reserves amounting to Y.37,538,956. This company has 17 factories, with 511,964 ring and 92,846 doubling spindles it operates 8019 looms. The head office is situated at Sumida-mura, Minami Katsushika-gun, Tokyo prefecture.

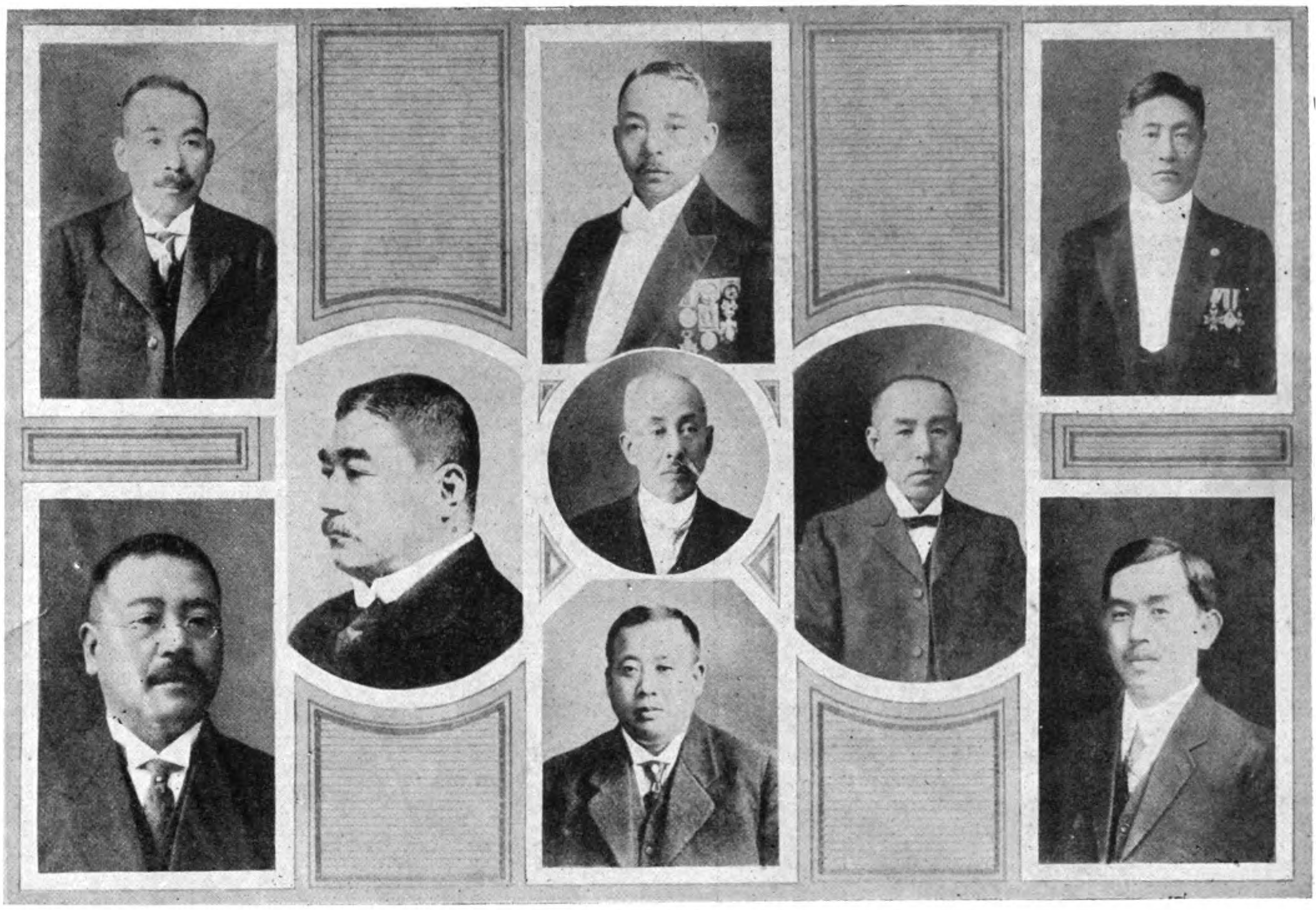
Restoration of Cotton Spinning Mills

Among the cotton spinning mills destroyed by the earthquake and whose capacity has been practically entirely regained are those owned by the Kanegafuchi Cotton Spinning Company, 30,000 spindles, the Nisshin Cotton Spinning Company, 52,000 spindles, the Tokyo Cotton Spinning Company, 20,000 spindles, and the Hashiba factory of the Dai Nihon Cotton Spinning Company, 78,000 spindles. The cotton spinning mills of the Tokyo Muslin Company, 20,000 spindles, and the Toyo Muslin Company, 48,000 spindles, have also been restored. The Toyo Muslin Company, in addition, is now rushing the construction of a mill in Shizuoka prefecture, which will have approximately 40,000 spindles.

The Fuji Gas Spinning Company, which received the heaviest blow by the earthquake, has restored something like 30,000 spindles, about 18,000 spindles of the Koyama No. 1 factory, and 12,000 spindles of the Koyama No. 2 factory. The Kawasaki factory of the Fuji Gas Spinning Company is now operating some 30,000 spindles. The Sagami Spinning Company, which had 30,000 spindles before the quake, is now restored to 20,000 spindles. The construction of the Oji factory of the Toyo Cotton Spinning Factory was begun in April, this year. This factory had approximately 60,000 spindles, but it soon will be restored to the extent of 30,000 spindles.

The Dai Nihon Cotton Spinning Company has given up the Fukagawa factory, Tokyo, which had 34,000 spindles and 9,000 doubling spindles. The Fuji Gas Spinning Company has also abandoned its Oshiage factory, Tokyo, which had 59,000 spindles and 21,000 doubling spindles. The Yokohama factory of the Hattori Cotton Spinning Company has also been given up; it had 11,000 spindles before the quake.

Among the spinning mills in which restoration work is making very slow progress are the Nos. 3 and 4 factories of the Fuji Gas Spinning Company at Koyama. The Odawara Cotton Spinning Company, which had 30,000 spindles, and the Nerima factory of the Johm Moslin Company, are also making but little progress in the work of restoration.



SOME LEADERS OF JAPAN'S TEXTILE INDUSTRY

Mr. Y. Kinbara, Managing Director, Mousseline Boshoku K. K.
Mr. Hisao Matsuo, Managing Director, Jomo Muslin Co., Ltd.
The Late Mr. T. Wada, President, Fujigasu Spinning Co., Ltd.
Mr. Katsutaro Inabata, President, Mousseline Boshoku K. K.
Dr. Kyozo Kikuchi, President, Amagasaki Spinning Co., Ltd.
Mr. M. Kita, President, Japan Cotton Trading Co., Ltd.
Mr. Denshichi Ito, President, Toyo Boseki K. K.
Mr. S. Kawasaki, Director, Mousseline Boshoku K. K.
Mr. A. Yamada, Managing Director, Japan Cotton Trading Co., Ltd.

2.—Japan's Woolen Industry

A Critical Survey by the British Vice-Consul at Yokohama

THE department of overseas trade has issued an interesting report upon the wool textile industry of Japan, furnished by the British vice-consul at Yokohama.

The work of collecting the materials on which the report is based was completed about a week prior to the earthquake of September 1, 1923, and as Tokio is one of the two great centres of this industry in Japan, the data relating to this area describes a state of development which has to a considerable extent been impaired. It therefore, would, be a useless task to describe the pre-earthquake conditions in any detail. In the first place, some of the factories in and around Tokio were very small, so that their destruction would not seriously affect the total output of the industry.

Secondly, in regard to the important factories which were damaged or destroyed, some of them at any rate were owned by companies which also operate in the unaffected area west of Nagoya. The organisation of such companies has not been destroyed, and they will be in a position to revive their activities when financial conditions enable them to do so. But apart from these considerations there is the more fundamental fact that the Japanese real demand for woolen fabrics is steadily and visibly growing, so that there is an expanding home market offering its attractions to men of enterprise. Moreover, it is most unlikely that the Japanese, having once reached a certain stage in the development of the industry, will ever rest content until they have at least regained the position where they stood before, and one may venture on the prophecy that in the course of a few years the industry will have fully recovered from the recent setback, and perhaps even have advanced still further.

Historically the industry in Japan began with the installation of weaving plants, manufacturing cloth from imported yarns, then spinning machinery was imported to operate on imported tops. Later still carding and combing machinery was imported for the manufacture of tops in Japan, and at the present time there are several large companies which carry on all the processes of woollen manufacture from the raw material to the finished article.

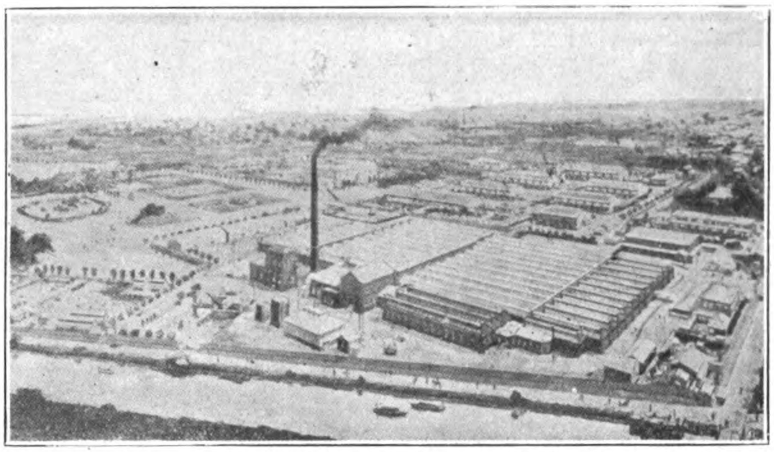
In many cases such firms only produce a portion of the tops and yarns which they require, and import the rest, but it may safely be said that those who control the Japanese woolen industry will never be satisfied until they are able to produce the bulk of the tops and yarns which they require and to cut down foreign imports to a minimum. The following figures give some indication of the great advance made since 1914 : there has been nearly a sixfold expansion in the industry as a whole :—

	1914.	1923.
Ring, cap, and flyer spindles ..	4,600	nearly 50,000
Worsted mule spindles	120,000	350,000
Woollen mule spindles	120,000	500,000
Noble combs	—	60
Continental combs	—	350

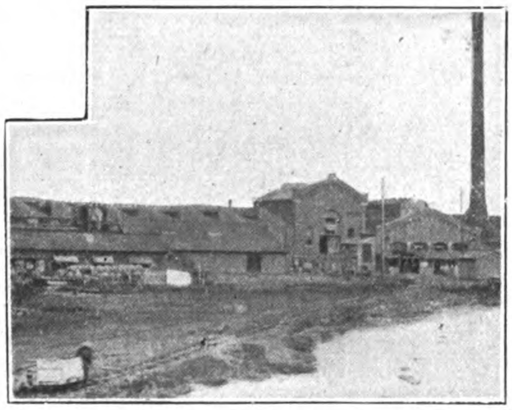
It is worth noting that early this year a Japanese firm (Goto Keori) imported two Lister combs for use with alpaca—the first machines of this type to be brought to Japan. But as alpaca fabrics are much used in the country further developments along this line may be looked for. One occasionally sees Japanese-made looms for the simplest kind of weaving, which appear to work fairly well, and attempts have even been made to manufacture a comb, but practically all the above machinery has been imported, because Japanese efforts to make [illegible] textile machinery have not met with much success. A good proportion of it comes from the United Kingdom, but French, German, and American machinery is also in use.

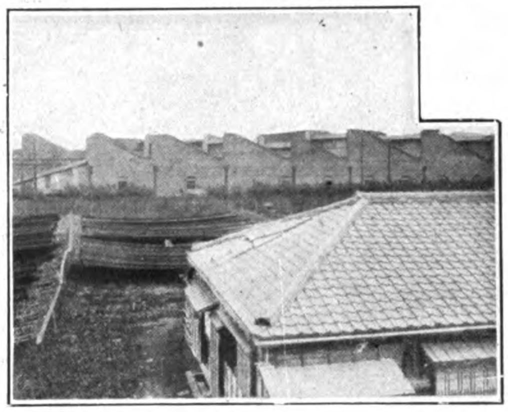
The United Kingdom then holds no monopoly in the manufacture of wool textile machinery. That machinery has a high reputation in Japan because of its quality, but if the Japanese were to be prevented from obtaining it their industrial expansion would not thereby be thwarted. They already use quantities of very good Alsatian machinery, and they would if necessary use more, and employ French or German technicians, as indeed they already do.

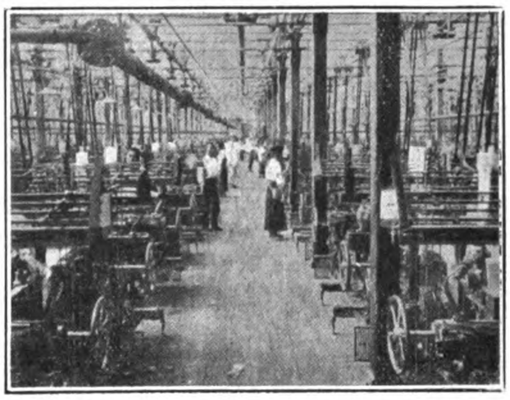
Such a course of action would be followed all the more easily in Japan, because they have so largely adopted continental rather than English methods; the most important woolen product in Japan is mousseline de laine, copied from France and not from Great Britain, where very little of it is produced; most of the spinning is dry spinning and not oil spinning as in Great Britain, and the finishing processes are continental and not English. The fact is that the growth of the Japanese woolen industry is simply a phase of that determination to achieve industrial self-sufficiency which is widespread in the modern world, and constitutes a wide economic problem in itself.

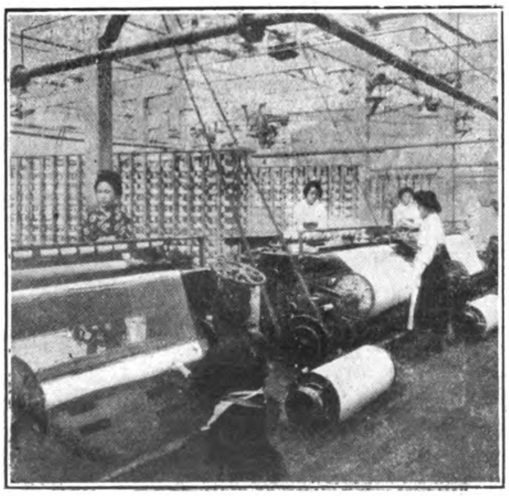


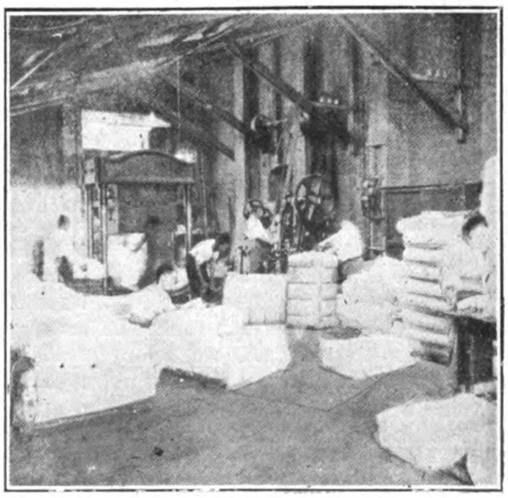
General View of Muslin Factory at Nakatsu, Nishinari-gun, Osaka











Toyo Muslin Kabushiki Kaisha (Oriental Muslin Co., Ltd.) General Views of First and Second Factories; Spinning Shed; Packing Room

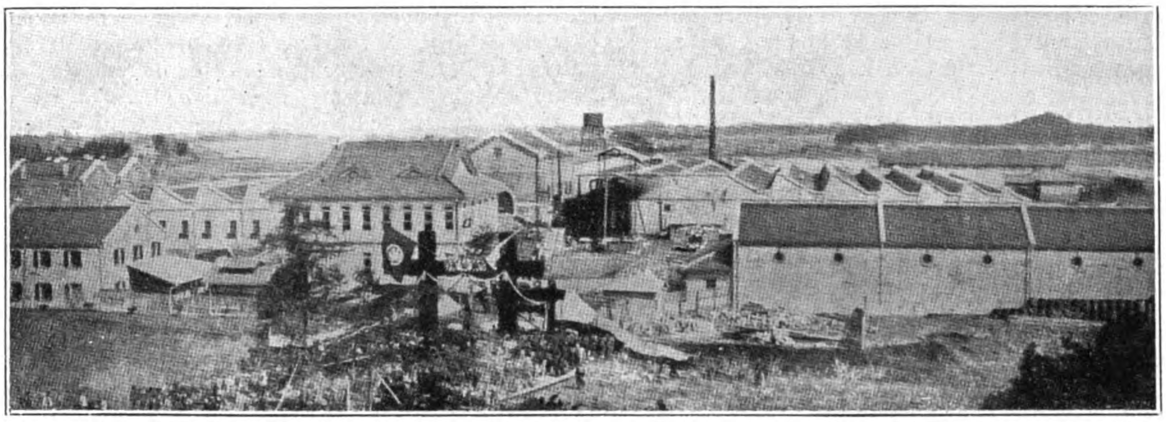
Notwithstanding the great development of the industry since pre-war days, Japanese imports of woolen textiles are still considerable, as the following figures show:—

	Woolen fabrics of all kinds, 1,000 sq. yds.
Best pre-war year	15,000
1918	5,400
1919	4,000
1920	11,000
1921	12,000
1922	25,000
1923 (six months)	10,000

These figures do not indicate any tendency toward a diminution of imports, and the recent disaster will no doubt have the effect of delaying the appearance of any such tendency. If it be asked why the imports have continued at such a level, the answer would seem to be threefold:

1. The most important single product of the native industry is muslin, chiefly used for native style garments, particularly those of women. Comparatively little muslin has been imported into Japan, at any rate in recent years, because it was perceived a long time ago that this fabric was peculiarly suited to the Japanese climate and Japanese dress; consequently its manufacture was started at an early stage, and the growth of the productive capacity of the industry for muslin has kept pace with the growth of the demand, and the muslin branch of the industry has been its most flourishing part.

2. As regards the woolen fabrics for foreign style clothing, which is chiefly worn by men, those produced in Japan are often of very poor quality, and can only find a sale owing to the protection of import tariffs, though some very good plain cloths are made. But in any case there is a demand for cloth of high quality, and this has to be imported, principally from the United Kingdom,



Kuzuke Mill of the Jomo Muslin Company, Ltd.

3. The third and widest reason for the continuing high level of imports is that the Japanese demand for woolens has grown and is still growing more rapidly than the Japanese woolen industry, and it is difficult to say how long this state of things will continue. There were signs, before the earthquake disaster altered the situation, that the industry was beginning to overtake the demand. Indeed, as regards mousseline de laine appearances pointed to a state of over-production within a year or two, and there were some who anticipated that the scale of muslin production within that time would reach 200,000,000 yards per annum. Men living in the cities are finding more and more that European clothes are the most suitable for Westernized conditions, and among women and children, as well as among men, woollen knitted goods are being used more and more. In connection with the popularity of mousseline de laine, it may here be mentioned that the English adviser of the Goto Keori Kaisha recently succeeded in making a muslin yarn of wool and silk waste, from which an attractive fabric is being made at a low retail price.

Industrial Organization

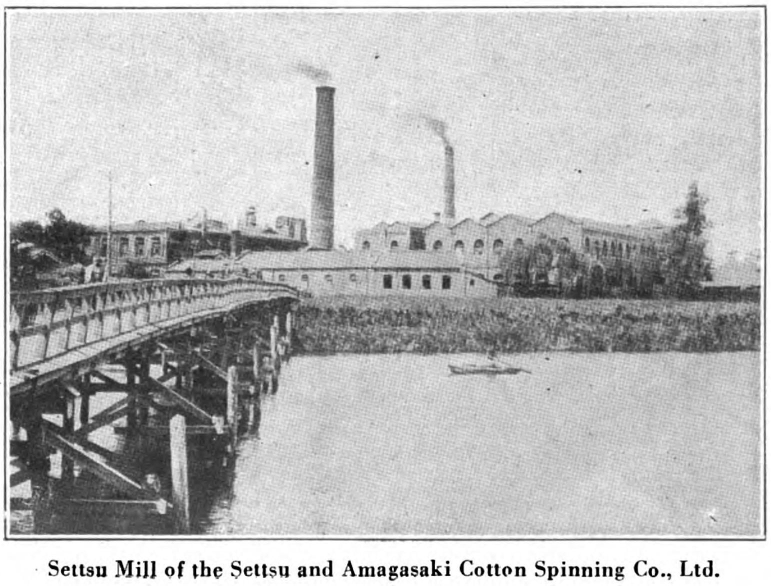
In the matter of industrial organisation, an observer familiar with conditions in the West Riding of Yorkshire is at once struck by great differences.

After describing the slow growth of the British wool industry over a period of more than a century, the report continues :—

The story of the Japanese woolen industry is different both as to origin, development, and result. The small beginnings date back to nearly fifty years ago, and joint-stock companies have been the general rule all the time. The government, too, took an interest in the rise of the industry, and one of the most important factories in the country is owned by the ministry for war.

At the present time there are upwards of thirty such companies, the largest of them owning three or four large mills each, and the total capital will not be far from £20,000,000. Accordingly large-scale amalgamation may be said to be characteristic of the Japanese woolen industry (although there are also some quite small companies), and it is interesting to observe that there are some mills in Japan larger than any in England.

Owing, however, to the fact that the full economies of production can be attained in a factory of moderate size, the mere size of some of these Japanese mills means nothing so far as efficiency is concerned. The cause is rather to be found in the fact that the average Japanese woolen company is not a specialised organism at all. Not only does it aim at carrying on all the processes of manufacture, which would not be considered unusual from an English point of view, but it also manufactures both woolen and worsted cloth, and sometimes things like blankets and rugs and felt and other things besides. The most specialised firms are those which manufacture muslin, but even one or two of them manufacture woolens as well, or, if not woolens, cotton goods.



Settsu Mill of the Settsu and Amagasaki Cotton Spinning Co., Ltd.

A Japanese woolen factory looks like a series of Yorkshire weaving sheds; owing to the danger of earthquakes all machinery is on the ground floor, and there are no factories of several storeys as in England. Consequently the industry has to reckon at the outset with a higher relative capital outlay for land than is the case in most other countries. Moreover the sites of some of the earlier factories were badly chosen in areas which were waterlogged and liable to river floods or in places where no soft water was available. All these things meant expense in one way or another, but experience has led to greater care being taken in the case of newer firms. Practically all the Japanese mills are run by electric power: some make it for themselves, but more commonly it is obtained from a power company.

Nearly all the raw wool used in Japan is imported from Australia, but a certain amount, not very large, comes from South Africa, South America, and China.

Tops are imported from the United Kingdom or Australia, and yarn from Germany and the United Kingdom. It is probable that at the present time Japanese importing firms like Mitsui, Okura, Kanematsu, and Iwai handle more of this business than the foreign firms. It is not surprising to find that there is very little woolsorting in Japan. In some even of the largest factories there is no wool-sorting department at all : the raw wool passes straight from the bale to the washing machine.

Here lies one great and probable permanent weakness of the Japanese woolen industry. Woolsorting is a process which cannot rely on machinery ; it depends absolutely on the sorter himself, on the sensitiveness of his eye and hand, and his knowledge of the material with which he is dealing. In England men acquire this knowledge through the practical experience of a score of years, and they have no counterpart in Japan. It follows that wool-sorting in the latter country is indifferently done, and, therefore, the tops and yarns of native manufacture are not on the whole noted for evenness. But evenness is one of the most important criteria of successful manufacture, and an English firm wins a high reputation when merchants can rely on getting from it textures which are even throughout a large number of pieces, and true to specification over a long period of years. In Japan such a degree of evenness is not achieved.

As regards plain goods, however, it may be expected that Japan will in a few years be able to supply all her own needs : the highest grades of cloth and fancy goods will continue to be imported for a long time to come because the Japanese cannot attain to the high quality of finish that the best English goods possess. Their methods of finish are continental, but experienced observers agree that it is not necessary for the Japanese industry to adopt the more expensive English finishing processes, because goods of medium quality are quite good enough for the greater part of the Japanese market, the persons who appreciate the fine qualities of the highest grade cloth being a very small number.

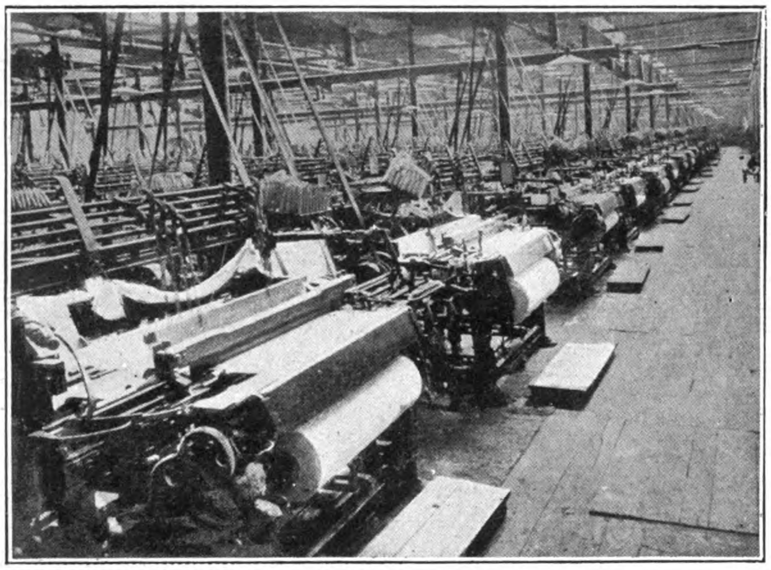
If Japanese mills were properly supervised they would be

dangerous competitors, as is proved by the few cases where mills have been under the technical control of foreign experts, but in actual practice it is only foreign competition which keeps the native manufacturers up to the mark at all. One great weakness is that there is no class corresponding to the over lookers in an English factory. The technical side of a Japanese mill is generally in the hands of quite young men who have taken a course at a technical school, but possess very little practical experience. Such men are far too fond of experimenting with the machinery instead of devoting their attention to such a dull subject as the production of an even yarn.

Unquestionably there is much ability on the theoretical side : Japanese have studied keenly in Bradford and Leeds, and I am informed that in some of the mills there are designers who would bear comparison with any, but for some reason or other there is weakness when it is a question of translating theory into practice. Even operatives at times interfere with the machinery, and I have myself seen a comb-minder using a spanner on a delicate part of his machine for no apparent reason at all. As a consequence of this state of things and of the lack of skill among the operatives, the proportion of waste in most mills is extremely high.

Perhaps the greatest difficulty of all that the Japanese manufacturers have to face is this, that they cannot get skilled labour. The hereditary skill passing from one generation to another in Yorkshire is quite unknown in Japan. It is very unusual for a girl to stay in a factory for more than about two years, so that the staff is constantly changing.

A description here follows of the firms which were visited in the course of this investigation. Some of the most important woolen mills in Japan are included, and between them they represent every noteworthy feature of the industry in the country.



Interior of Mill of the Mousseline Spinning & Weaving Company, Ltd., at Nishinari-gun, Osaka

Toyo Muslin Company

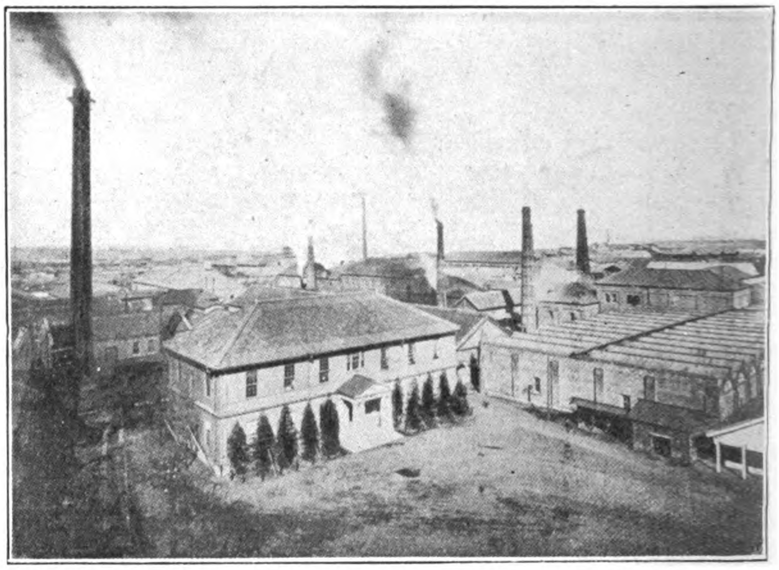
This company was formed just after the Russo-Japanese war, and now owns two woolen factories as well as two cotton factories closely adjoining. The one I visited was a well-equipped modern building of the layout that is usual in Japan. The company manufactures cottons as well as muslin, and the cotton branch appeared to be on a larger scale than the woolen. In reply to a question the manager stated positively that they did not manufacture any composite fabric of woolen weft and cotton warp.

Spinning Department.—All the spinning is done by mules combined with French drawing, because this method gives a worsted yarn which is softer and fuller than that produced in any other way, and is therefore very suitable for the manufacture of muslin. Many of these machines were of Alsatian origin, but the majority had been supplied from Great Britain. At the time of my visit the number of spindles was 20,000, giving employment to 300 persons, but these spindles were to be increased to 40,000 within a very short time.

Weaving Department.—Since the tissue manufactured is a simple weave, the looms are entirely of the narrow "tappet" variety. Some of these again were of Alsatian origin, a few appeared to be Japanese, but a great many had been supplied by a British firm. There were 400 looms altogether, with 600 workpeople, but the number was to be increased at an early date to 900 by means of changing over 500 looms which at the time of my visit were being used for cotton tissues. I did not see any machinery standing idle in any department.

Other Departments.—The company is principally engaged in spinning and weaving from imported tops, but it does carry out other worsted processes as well, though they are not yet on any great scale. It should perhaps be mentioned that the firm does all its own bleaching. I was not able to see these departments, but all stages are represented, from sorting to bleaching, and I understood from the manager that they were studying dyeing. The combing equipment is one set of twelve continental combs, and the carding machines are eight in number. These miscellaneous departments give employment to a further 200 workpeople.

Raw Materials and Output.—I was told that the firm made about 25 per cent. of the tops it required, the remaining 75 per cent. being imported, largely from the United Kingdom. The raw wool used is entirely Australian merino, because the tops required are all of the finer counts between 64's and 70's. When working full time the mill can turn out well over 1,000,000 yards of muslin per month. The organization of the plant, enabling all worsted processes to be carried out, from the raw material to the finished tissue, is parallel to that of many worsted factories in Yorkshire. The size of the combing and carding plants relatively to the spinning and weaving is also significant as illustrating the stages by which the industry in Japan has grown : first, the weaving of imported yarns ; secondly, the spinning and weaving of imported tops ; thirdly, the manufacture from the raw material. The workpeople are predominantly women and girls, with a few men and boys. They appeared to be working quite contentedly and industriously, and the buildings themselves were airy and well-lighted from above so that the working conditions were satisfactory in every way. I have already mentioned the increase in spindles and looms that was projected. I had a general view of the premises from the roof, and could see one large extension practically completed and another about half finished. The number of employees in the spinning and weaving departments relatively to the number of machines is interesting when taken in connection with the complaints about overhead charges.



The Senju Woolen Cloth Factory operated by the Army Department of the Imperial Japanese Government

Goto Keori Kaisha, Gifu

This is one of the most interesting as it is one of the most flourishing companies in Japan. The head of the firm, Mr. Goto, is one of the pioneers of the industry, and the factory is under the supervision of an Englishman. It is very extensive, and a wide range of goods is produced. There is less specialisation in the Goto mills than in a large Yorkshire mill, for both woolens and worsteds are manufactured. The main products are light worsteds (including muslin), but most fabrics are also produced, including velvets, plushes, and carpets.

Preliminary Processes.—Raw materials (both wool and tops) are largely purchased in Australia through such Japanese agents as Mitsui, Okura, and Kanematsu. In the Goto mills only the better grades of wool are used, and the principal item is merino for muslin. No wool-sorting is done at all. Wool passes straight from the bale to the washing machines, of which there are two, and also two drying machines. Next in order are :—

(a) On the woollen side :—
- 6 sets of cards,
- 8 mules (3,000 spindles).

(b) On the worsted side :—
- 12 sets of cards,
- 16 Noble combs,
- 12,000 cap spindles.

Practically all the above are of British manufacture, and it is noteworthy that some of the spinning is oil spinning—a very unusual thing in Japan. Another interesting development at this factory is that it is operating the first alpaca spinning plant in Japan, as mentioned earlier in this report. A small beginning is being made with two Lister combs, one set of drawing machinery, and ten flyer frames (1,600 spindles), and it is intended to start a sorting department for the alpaca.

Spinning.—The range of counts is 5's to 100's (metric). The Goto Company is the first woollen firm in Japan to have individual electric drives for the machinery, and the electric power costs about Y.600 per diem for the whole of the works.

Weaving.—There are 600 looms altogether, some for woolens, but most of them for light worsteds. Four hundred of these are full width box looms, and 200 are narrow. There are also one or two special machines for plush, velvet, etc., and two Jacquard looms. Very few of these machines are British. I saw one or two of Japanese manufacture, but the great majority were German. Most of the machinery in this factory is quite new.

Other Processes.—No bleaching is carried out at the Goto mills, but there is both dyeing and finishing. As usual in Japan, finishing is done after the continental and American plan, not after the English, the finishing machinery being largely German.

Labor.—The number of workpeople is, roughly, 2,000, made up as follows :

Worsted Section :—	
Combing, drawing, and spinning ..	350
Shortly to be increased to	500
Woollen Section :—	
Carding and spinning	150
Weaving :—	
Including finishing	1,300

The average wage per diem is as follows :—

Worsted section (female)	Y.1.30
(male)	„ 1.00
Weaving (mostly women)	„ 1.50
Male plush weavers	„ 1.80

At this mill there is the compound, or " living in " system, applying mainly to female spinners. Their food costs about 28 sen per diem, of which they pay 15 sen themselves, while the firm pays the rest. It thus appears that there is little difference between spinners and weavers' wages, and it is notable that male labor is cheaper than female, though most of the operatives are females. The workpeople are divided into day and night shifts, and each person works day shift and night shift alternately for a week at a time. The machinery is running twenty-two hours each day—a great economy of capital.

It would seem from these facts that labor is not so cheap as it is sometimes held to be. The hours worked by one person in a month are longer than in the case of an English operative, but the labor cannot be compared with English labour for efficiency. A spinner or weaver will be able to earn from Y.35 to Y.40 per month, or, roughly, up to about £1 a week.

At Goto mills, as elsewhere, the great difficulty is that labor is constantly changing. It is rare for an operative to stay more than eighteen months, and many stay a much shorter time. Bad conditions cause the girls to demand holidays periodically, and owing to non-attendance about 10 per cent. more persons are employed than would suffice to run the machinery at a given time.

Senju Government Mill

Senju Seijujo is the only woolen mill in Japan actually owned by the government, and the bulk of its output is for army use. It may be remarked, however, that some time ago officials of the war department visited every woolen establishment in Japan, taking particulars of the machinery, etc., so that in case of war these places could very speedily be turned on to government work.

As is generally the case in Japan, the factory is less specialized than an English factory in that it has both a woolen and a worsted section, the former being much the larger. The chief products are army cloth of all qualities, army blankets, knitting yarns for underclothing and felt for saddles.

Preliminary Processes.—The raw materials used are :—

1. Australian (merino and crossbred).
2. Cape (mohair).
3. China wool.
4. Wool waste (treated by Garnett machines).

There is a sorting department, but, as might be expected, the sorting is very badly done. Most of the sorters are men, but the China wool is sorted by women, and into only two grades, the coarser for blankets and the finer as one ingredient for men's tunics. The blankets are composed of one part China wool and one part crossbred and waste.

Washing and Drying.—For this process there are two British machines.

Woolen Branch.—On this side are 36 cards and 45 mule frames for the manufacture of blanket yarns and yarns for woolen cloth. These machines are mostly of British make.

Worsted Branch.—This consists of two cards, three Noble combs, and 1,600 cap spindles (eight frames), mostly supplied by a British firm. On this side are manufactured the finer yarns for officers' clothing, and knitting yarns. Thus, taking the factory as a whole, there is spinning over a fairly wide range of counts.

Weaving.—The weaving plant consists of 210 broad looms (90-in.). Some of these are British, but most are German.

Other Processes.—The dyeing is done entirely with German dyes, and the finishing processes are, as usual, continental.

Labor.—The factory is worked in a single shift, 7 a.m. to 5 p.m., with one hour's rest. The workpeople number about 1,300 most of them being girls, of whom 200 can be accommodated in the compound in quite good quarters.

The percentage of waste is extremely high in most Japanese mills, and I saw no evidence which would lead me to suppose that the government mill is an exception to this rule.

As for wages, a woman can earn up to Y.1.20 and a man up to Y.2.00, and in addition the workpeople can obtain meals, baths, medical treatment, etc., on exceptionally favorable terms.

All the workpeople can buy goods and supplies from the canteen at cheap rates, as, for example best Australian beef at 20 sen for 100 *momme* (about 6½d. per lb.). The cost of a meal obtained from the factory cookhouse is 5 sen or 10 sen. There is also a barber's shop where the men cut each other's hair, paying a small fee for the loan of the clippers, a lending library for books and magazines, and a stock of umbrellas which are lent out in case of rain. I was informed that the workpeople are so happy that they never give any trouble, and the factory is in a position to compel a person seeking employment to undergo an intelligence test before being taken on. A hospital is also provided, with a staff of four doctors, including a military one ; any kind of medical treatment can be obtained, there being special theatres for eyes, nose and ears, dentistry, and operations. The rate charged for a patient is Y.1.20 per day, which includes medicine, food, and attendance.

Output, etc.—The only materials purchased from outside are the various kinds of wool ; the factory produces all its own yarn and tops. It was stated that the output in a normal day was about 3,330 linear yards.

Tokyo Keori Kaisha

This company owns four mills, at Oimachi, Senju, Oji, and Nagoya, and I was taken to see the one at Oimachi. To speak first of the company as a whole, it is as usual a large, non-specialised, joint-stock enterprise, with a capital of about £2,000,000, at present financially weak, and three of the four mills are twenty-five years old, equipped with machinery, which, as it has been running twenty-two hours a day during most of this period with no particularly good supervision, is now in poor condition. The chief products are light worsteds of medium quality, low quality, " melton," army blankets, army cloth, flannel, plush, astrakhan, beaver, and carpets.

Raw materials :—

1. Australian merino.
2. South African mohair.
3. China wool (for blankets and army cloth).

The whole company employs 5,000 workpeople, about one-third of them men, and it has 45,000 spindles and 980 looms.

The Oimachi Factory.—This factory turns out all the goods mentioned above, but none of the worsted yarn is made on the premises. The "meltons" are very low grade woolens, some of them with a worsted warp and some with a cotton warp. The ingredients are noils, rags, cotton, and low grade wool. At this mill all woolen processes are carried on.

Sorting.—I was not shown this department, but I gathered that the work there was of the rough-and-ready type.

Washing.—This is done by two machines of British manufacture.

Carding.—There are twenty-five woolen cards, five of American manufacture, the rest German.

Spinning.—This is done by twenty-four mule frames, all German. I was particularly struck by the inefficient and wasteful way in which it was being performed. Only low counts are spun (blanket yarns and heavy woolens).

Weaving.—The total number of looms is 280. Ten of these are jacquards, about twelve are for plush, etc., and most of the rest appeared to be ordinary broad looms for plain weaves. Practically all these machines were German.

Other Processes.—The finishing processes are continental, and most of the machinery in this department also is German. Plain dyeing for things like army blankets, is done on the premises.

Labor.—I was informed that men's wages were about Y.1.30 per day, and women's about Y.0.90, and that meals were sold on the premises at the rate of 10 sen for three meals. The factory employs 2,000 people, and of these 800 girls live within the compound. Conditions were fairly good, but some parts of the mill left something to be desired in the way of cleanliness.

The Nippin Keori Kaisha

This company is by far the largest in Japan, having a capital of about £5,000,000 paid up and owning four large factories :—

1. At Gifu—entirely for muslins.
2. At Himeji—for muslin yarns.
3. At Inami—where the machinery is mostly German, bought up soon after the war ; and
4. At Kakogawa—for muslins, all clases of worsteds and woolens.

These mills are the best managed in Japan, and the finances are very good. During the war dividends of 50 per cent. were paid, and since the war they have been 30 to 40 per cent. The total machinery owned by the company is as follows :

Worsted.	
Cards	79
Noble combs	9
Continental combs	150
Cap and ring spindles	19,000
Mule spindles	74,700
Woolen.	
Cards	65
Mule spindles	32,640

There are 771 broad looms and 972 narrow, or 1,743 in all. The workpeople number 10,000, 60 per cent. being females, and the average wages are : females Y.1.15 per day, males Y.2.10 per day.

The mill which I visited was the one at Kakogawa, and I was not a welcome visitor, and was shown as little as possible.

The Kakogawa factory covers a large area, and gives employment to about 5,000 people, and it has both a worsted and a woolen side. There are three washing and three drying machines, all of Japanese manufacture.

Worsted Branch.—There is no weaving of worsteds or spinning of muslin yarn at this factory, that work being carried out at Inami. The following are approximately the numbers of the machines : Cards (? German), 6 or 8; Noble combs, about 8; continental combs (Alsatian), a fair number ; continental drawing (Alsatian), a fair number ; cap and ring spinning, about 80 frames; mule spinning, about 25 frames.

Woolen Branch.	
Cards	23
Mule spinning (German)	25
Broad looms (German)	235
Jacquard looms (German)	15

The fabrics produced on this side are serges, some with cotton warp, and blankets.

Labor.—About 1,000 girls are accommodated on the premises, after the usual plan, but I did not see their quarters. The day on which I visited the factory was extremely hot, the atmosphere of the rooms was almost unbearable, the more so because the buildings are old and not well ventilated, and the operatives were obviously suffering very much.

Mosurin Boshoka Kaisha, Osaka

This company owns four mills in the Osaka district—at Nakazu (the one I visited). Imazu (formerly operated by a separate company, the Toyo Keito), Tanouchi, and Tsukuda. The mill at Tsukuda, with 30,000 spindles, is a cotton mill, and therefore outside the scope of this investigation, but it is worth mentioning because this is not the only case of a cotton mill and a woolen, especially a muslin mill, being owned by the same company. The same thing has been pointed out in the case of the Toyo Muslin Company in Tokio, and I think there is some talk of the Kanegafuchi Spinning Company beginning the manufacture of mousseline de laine. The main reason for this combination would appear to be that the looms used in the manufacture of wool muslin are also suitable for making cotton tissues, and *vice versâ*, so that according to the market demand they can be turned over from one use to the other very quickly.

Imazu Mill (formerly Toyo Keito Kaisha).—I was unable to visit this mill, but was given the following information about it :—

Its work is in two branches—(*a*) the manufacture of woolen yarn (counts 5's—48's)—mainly for knitted goods. This yarn is made from low-grade crossbred, and there are ten ring spinning frames (2,800 spindles). My informant stated that these frames were of Alsatian make. (*b*) The manufacture of muslin. For this there are two sets of French drawing and two sets of French combing. For spinning there are twenty-four mules (Alsatian), with 640 spindles each and the weaving department contains 540 narrow looms, largely British.

Nakazu Mill.—This mill was the object of my visit, and the officials whom I met did all they could to facilitate my inquiries. Contrary to the attitude in such companies, they did not regard my visit with suspicion, but said that they were glad to open their doors to foreign visitors. The building is twenty-five years old, and was planned by a Frenchman. The company's engineer told me that they were not satisfied with it as the roof was too low, the rooms were dismal, and consequently the temperature was about 3 deg. higher than at their Tanouchi factory—a serious consideration during an Osaka summer.

The principal product at this mill is muslin, but there are ten bunting looms, making bunting from crossbred yarn which is imported entirely from the United Kingdom.

Preliminary Processes.—The raw material is fine-grade Australian merino, which is roughly sorted before washing. There are two washing machines of American manufacture, and two Japanese-made drying machines. As the wool comes out of the drying machine it is treated with olive oil.

Carding, Combing, etc.—There are twenty-one cards (Alsatian). The slivers from these machines are not taken off separately, machine by machine, but the slivers of four or five machines are combined by mechanical means into one big sliver. The drawing and combing are entirely continental and consist of four sets each, to be increased in the near future to five sets each. All these machines are Alsatian.

Spinning.—All the spinning frames are mules, mostly Alsatian—*i.e.*, forty-four machines—but there are also ten of British manufacture, making fifty-four altogether. The engineer told me that he personally preferred the British machine, and in the new factory at Tanouchi the proportion of such machines would be increased.

Weaving.—There are 1,050 narrow looms, practically all British. All the yarn except that for bunting is produced on the premises.

Other Processes.—There are three or four machines for preparing reeds and healds for the looms, and the firm does its own bleaching, but no dyeing. I was informed that the production was about 1,100,000 yards per month.

Labor.—At the time of my visit the working day was a single shift of eleven hours, including one hour for meals. There are 4,300 employees, mostly women and girls, and the average daily wage is about Y.1.50.

Chuo Keito Boseki Kaisha, Ogaki

This company, which is largely controlled by Iwai & Co., with a capital of about £400,000, has just erected a spinning mill at

Ogaki, and it had not begun to produce at the time of my visit, though it was on the point of doing so. The mill is without doubt one of the very finest in the country, being very well built, and the rooms are lofty, light, and well ventilated. It is for the present confined to spinning and earlier processes, though it is expected that a weaving department will be added at a later date. The machinery has been supplied entirely by the Societé Alsacienne de Constructions Méchaniques of Mülhouse, at a cost of £100,000, and French engineers were tuning the frames, etc., when I was there. The machines are as follows : Washing and drying, 1 each ; cards, 16 sets ; continental combs, 24 sets ; French drawing, 2 sets ; mule spinning (counts 40's to 70's), 12 frames, 7,560 spindles ; ring spinning (counts 10's to 40's), 12 frames, 4,800 spindles ; twisting, 6 frames ; doubling, 5 frames.

It is intended to make muslin yarns partly from tops imported from the United Kingdom and Australia.

I was told that most of the girls were being brought from Kyushu and other country districts on a contract of two or three years, and the company was evidently determined to make the conditions as attractive as possible. I noticed that all the female operatives had been supplied with neat overalls, and great pride was taken in conducting me over the dormitories. Ten girls are accommodated in a room 18-ft. by 18-ft., and there are thirty-six such rooms per dormitory. The rooms are airy and clean, and I am told that they are a great improvement on the disgusting labor conditions which formerly obtained in Japan, and I have certainly seen none better in the course of these investigations. Such accommodation, however, would be regarded as overcrowding in England. It is only fair to add that there is ample provision for baths ; there is a good dining-room, and a well-planned hospital and dispensary with a doctor in constant attendance. Provision is also made for such sport as the operatives care to indulge in after they have spent their ten or eleven hours in the factory.

The principal points of the foregoing may be briefly summarized as follows :

1. Owing to the earthquake disaster the Japanese woolen industry has suffered a set back which will give an additional opportunity to United Kingdom exporters of woolen goods to Japan (in so far as that is not counter-balanced by Japan's reduced purchasing power). It would be unwise to expect this effect to continue for more than three or four years, and it may not continue so long.

2. The Japanese industry has largely developed along continental rather than English lines. Nevertheless, there is a good opening for British textile machinery and for British tops, and in a smaller degree for British yarns.

3. In spite of the difficulty of training skilled workpeople, and the general lower standard of efficiency as compared with the British industry, it may be expected that the Japanese will be able in the course of a few years to meet practically all their own requirements as regards plain goods up to a fairly high quality but for a long time to come Japan will have to import fancy yarns and the highest class of woolen goods and, in a long view of the situation, the chief opportunity of the British exporter lies there.

4. Japan's demand for woolens has been increasing in the last few years at a more rapid rate than her woolen industry, otherwise the imports of woolens would have tended to diminish before now ; but the British exporter should be prepared to find this tendency asserting itself more and more in the future.

5. The chief specialty of the Japanese woolen industry is wool muslin. This branch has reached a high stage of development, and Japan does not need to import this fabric at all, but she imports the machinery, and Great Britain can supply that machinery.

Proposed Extension of the Water Supply of the Metropolitan District of Manila

(Continued from page 338.)

proposed Novaliches storage reservoir, and from this reservoir another tunnel 6 kilometres long, brings it to the proposed filter beds from which it will connect by means of pipe lines to the present system. A very large part of the first section of the tunnel will be in Andesite rock which will not need any timbering, and will probably not be lined with concrete, while the remainder of the first section and the whole of the second section, will go through adobe rock, and all of it will have to be lined with concrete, and a good deal of it will have to be timbered.

The dimensions of the tunnel as per preliminary design are as follows :

Capacity, 80,000,000 gallons per day	
Height, finished	6 feet
Width, finished	5 „
Length about	23.5 kilometres

Storage Reservoir.—The proposed storage reservoir is located at Novaliches, a distance of some 6 kilometres from our present tunnel line which brings the Montalban water to the city. It will consist of an earth dam about 100 feet high which will dam the Novaliches river and will form a storage basin containing 6,000,000,000 gallons of water, in the upper 20 feet layer of the basin. The lower part will probably contain half as much, but due to the elevations of the tunnels will not be available for use by the district. This storage reservoir will provide sufficient water for 120 days at the rate of 50,000,000 gallons per day, so that in case of an extraordinary low run off of the Angat river, there will be sufficient storage to tide over the dry season. It will also serve as a very large settling basin, in which sedimentation will purify the water, and due to its great depth, no danger of the growth of algae need be feared. It will also act as a compensating reservoir to store the water there during the rainy season, so that we will not have to take the whole flow of the Angat river during the dry season and so deprive the riparian right owners from their share of the water of the river.

Finally, as the Novaliches reservoir and the second section of the tunnel, above described, can be finished a couple of years before the whole project is finished, relief will be had by the district to get the additional supply that will be made available from the run off of the Novaliches river.

Several tentative designs were made for the earth, dam, but no decision has thus far been arrived as to whether the dam should have a concrete core wall, or a clay puddled core wall, or a concrete apron with a cut off wall, or a clay mattress in front of the dam to reduce seepage. In general the location for the dam is quite favorable, except for the considerable height needed. The foundations are satisfactory, and ample material is available for its economical construction.

The approximate dimensions are as follows :

Height	100 feet
Slope-on both sides	3 to 1 „
Length at crest about	1,000 „
Width at crest	20 „
Width of shelves	20 „
Width at toe	500 „

Filters.—The filters are proposed to be sand filters capable of filtering 20 to 25 million gallons per acre per day. This is rather an unusual amount for sand filters, but as the water is of very good quality and undergoes a great deal of sedimentation, and ultimately chlorination, the filtration may take place at a much more rapid rate than in the regular slow sand filters.

Chlorination.—A chlorination plant will be installed at the point where the water enters the distribution system. At the present time all the water is disinfected with calcium hypochlorite, as the chlorine gas method is all but prohibitive in cost, due to the transportation charges on the gas cylinders, and the return of same to the United States. But if chlorine gas could be obtained at a reasonable cost, the disinfection would be done with chlorine gas, as it is more effective and easier to control.

Distribution System.—About P.1,000,000 will be expended for the enlargement and extension of the distribution system, which will consist mainly of cast ironpipe construction, varying in size from 6-in. to 42-in., and will reinforce the present distribution system, and increase water pressure in the city to a minimum of 30 pounds.

Sanitary Sewerage System.—About P.1,000,000 will be expended for the extension of the sanitary sewerage system in the city of Manila, for the construction of several additional sewerage pumping stations, extension of sewerage pipe lines, and possibly the installation of a third pump in our present main sewerage pumping station and an additional 42-in. cast iron pipe outlet for a distance of some 6,000 feet into the bay of Manila.

All the work described as per project III including the distribution system and sewer extensions, can be built within the sum of the authorized P.12,000,000, including interest on the money and sinking fund charges during the period of construction.

Proposed Extension of the Water Supply of the Metropolitan Water District of Manila

By A. Gideon, C.E.

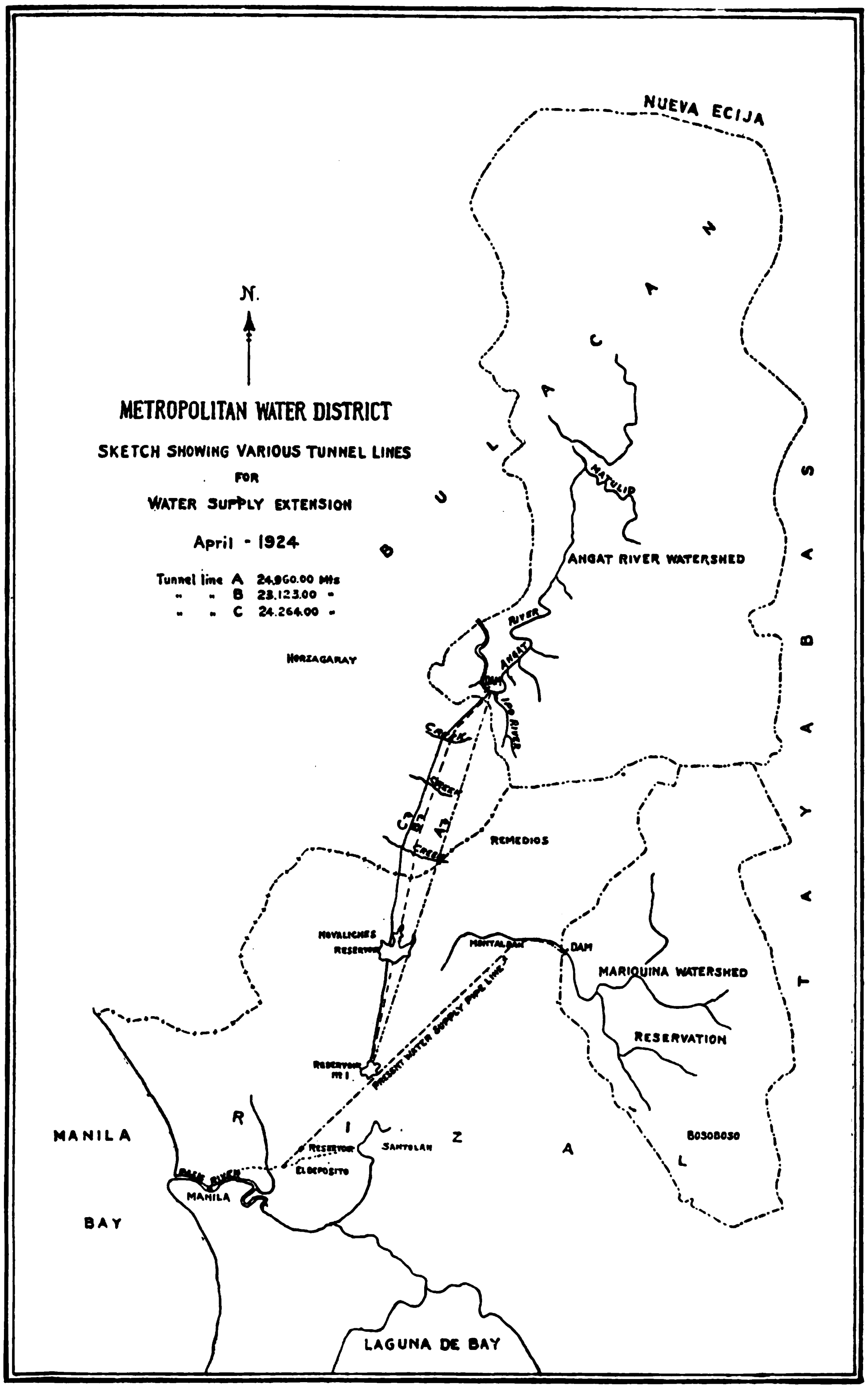
(Member of the American Society of Civil Engineers; Member of the American Waterworks Association, etc. etc.); Manager and Chief Engineer

THE article published in Volume XIX, No. 5, for May 1923, of The Far Eastern Review, entitled "Manila Water Supply," reviews the history and present conditions of the water supply. This article briefly reviews plans for the extension of the water supply of the the metropolitan water district of Manila.

The population of the city of Manila in 1903 was 216,000 and is at the present time a little over 300,000, and estimating the increase to continue at the same rate, Manila will have a population of 560,000 in 1950.

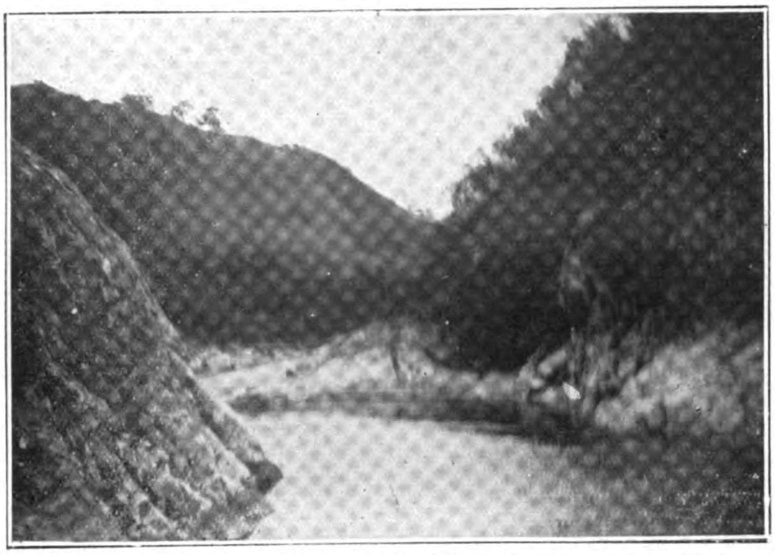
The amount of water available for all purposes in 1903 was about 28 gallons per capita per day, or a total of 6,000,000 gallons per day, which was supplied by the Santolan pumping station on the Mariquina river.

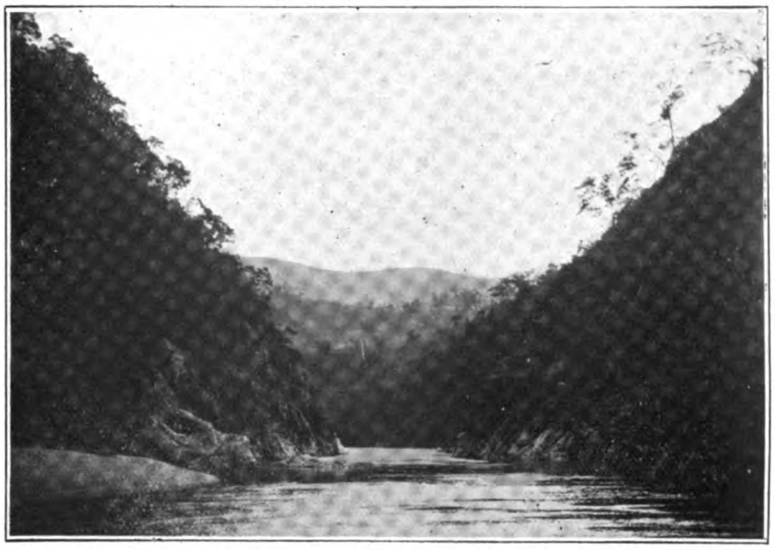
The extensions which were started in 1903 and completed in 1909, provided a gravity water supply from the Mariquina river, with the intake or headworks located about fifteen (15) miles above the Santolan pumping station. The capacity of the pipe line was 21,500,000 gallons per day, thus providing for an estimated population of 300,000 at 70 gallons per capita per day for 1923. However no storage was provided to carry over the city during the low run off of the river, and as the run off of the river is very much reduced during the dry season, we have had to resort to the Santolan pumping station, to augment the supply every dry season since 1912.



The per capita consumption likewise continued to increase every year, so that in 1923, the per capita consumption was 75 gallons per day, and more could be used if it were available, there being many days during which the consumption was as high as 25,000,000 gallons per day, or 83 gallons per capita per day. It was therefore evident some years ago, that due to the rapid increase in the population, and the more rapid increase in the per capita consumption, the present supply would soon be inadequate to the demand, and studies were made, not only of the engineering features, as to how to increase the supply, but also as to how to finance the required extensions in the best and easiest way, and to so manage the water supply that it would be a self-supporting institution.

The city of Manila, —then administering the water supply, was bonded for P.8,000,000 for sewer and waterworks bonds, or the full extent of its borrowing capacity, and needed considerable funds for financing the many other urgent demands for





Two Views of Pared Dam Site where a Dam 270 feet High was Planned but the Project was Later Abandoned

improvements, such as new schools, improved roadways, etc. etc., and if the water supply and sewers could be made self-maintaining the city of Manila would be relieved of the burden of financing the water supply, and if due to the city's growth in population and wealth, its borrowing capacity was increased, it could issue bonds for other urgently needed improvements.

It was accordingly recommended to the legislature, that a metropolitan water district be created, to consist of the city of Manila, its suburbs and a number of towns along the pipe line. The legislature authorized the creation of the district, and also authorized the district to borrow P.12.000,000 Philippine currency or $6,000,000 United States currency in addition to assuming the present $4,000,000 United States currency indebtedness of the sewer and waterworks bonds.

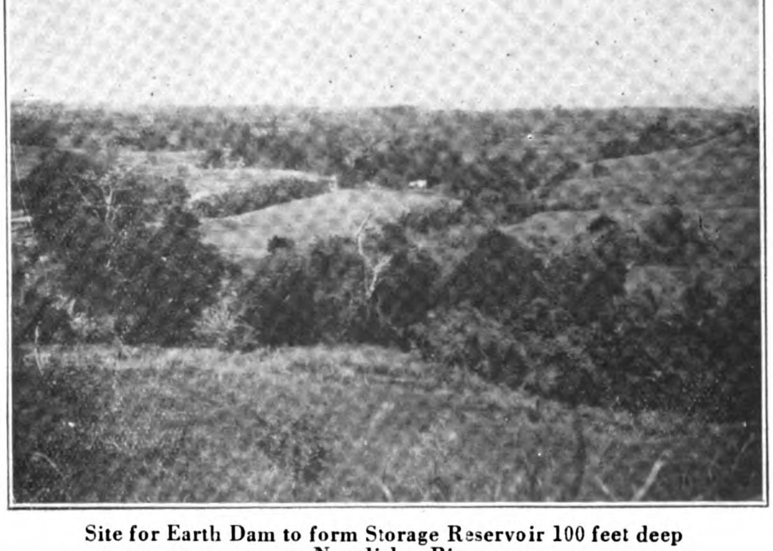
Upon the organization of the metropolitan water district measures were taken to determine a feasible and economical way to carry out the needed extensions.

Three different major projects were studied, to determine which one would be the best adapted for the district needs. Due to the fact that a very considerable investment was already had in the present plant, the first investigations and studies made were along the lines of extending and developing the present source of the water supply on the Mariquina river. The studies made showed that we could develop the present source to furnish a maximum of 50,000,000 gallons per day by building two high dams upstream from the present Montalban dam and the necessary pipe lines to deliver the water to the city. The estimates based upon these studies showed, however, that the work would cost about P.3,500,000 more than the amount we were authorized to borrow, besides the line would be very complicated, and would require constant expert vigilance in operation, and some of the works such as the steel pipe lines would be good for about 20 or 30 years only, as due to probable oxidation, electrolysis, etc., they would have to be renewed from time to time.

As there was an impression that a hydro-electric plant could be built together with the water supply extension, the law creating the metropolitan water district authorized the district to engage in hydro-electric development in addition to its other functions, and accordingly the second project investigated was the development of the Angat river for both a domestic water supply and hydro-electric prower.

The Angat river has a watershed of 275 square miles, and is but 35 kilometres or 22 miles north of Manila in a straight line. The watershed above the proposed intake, is very rugged and sparsely inhabited and for the most part covered with forests. The rainfall on the watershed is very heavy, averaging over 100 inches per annum, so that the total river run off is very considerable.

The water was analyzed for a period of one year to determine its variation with the climatic condition, and was found uniformly satisfactory for domestic purposes—both from the chemical and bacteriological standpoint. In fact it is somewhat better than the present supply which is also of a very high quality. The gaging of the river was intermittently carried on by the bureau of public works for several years, to determine the run off of the river. There was no question but that the run off would suffice for the domestic needs of the metropolitan water district during the rainy season, and even, during the most of the months of low river run off. Due to the sharp division between the rainy season and the dry season and the considerable length of the dry season, the rivers in this vicinity have a very low dry season discharge, which has an



Site for Earth Dam to form Storage Reservoir 100 feet deep on Novaliches River

Drilling Force Hauling Rock Drill up Hillside to Test Rock at New Dam Site

important bearing on the amount of storage to be provided. The hydrographs of the river showed that the minimum monthly discharge during the period of the river gauging was of an average of 80,000,000 gallons per day, or just sufficient for our ultimate needs for a domestic water supply 50 years hence or about the year 1975. So that this source was in every way satisfactory for a domestic water supply.

However, for power purposes vastly greater amounts of water are needed, so that while there was no doubt that sufficient water would be available in the rainy season, yet to make a hydro-electric plant a financial success, power must be available the whole year round. Due to the ruggedness of the country, no really good sites are available for storage reservoirs where cheap storage could be combined with safety of structures.

Several sites were investigated and one at Pared was studied in detail. This site was in a narrow canyon and by building a dam 270 feet high, sufficient water could be impounded to develop a maximum of 17,500 K.W. of which 3,350 K.W. would be primary, or available throughout the year, and for four months per year we could deliver 12,650 K.W. additional power.

The total cost of the work was estimated to cost P.36,000,000, and deducting the P.12,000,000 for the cost of the water supply, would leave the cost of the hydro-electric development at P.24,-000.000. The income, however, from the sale of power would not be sufficient to pay expenses for the additional outlay. Besides difficulty was encountered to provide spillways at the dam site, and the design provided spillways in tunnels which were costly, and all but impracticable, as the water in the tunnels would develop a velocity of 50 feet per second, and probably cut away the rock. A dam 270 feet high in a tropical country subject to earthquakes was not a very desirable feature.

Accordingly the third project was adopted, *i.e.*, the construction of a water supply extension only with its source at Ipo on the Angat river. The project is very simple, and with very little care will last indefinitely. It consists of a masonry dam at the intake, a tunnel to a storage reservoir, a storage reservoir, and another tunnel connecting the proposed extensions to the present water supply mains, together with filter beds, chlorination plant and possibly aeration.

Dam.—The dam will be a spillway dam of the Ogee type, located at Ipo on the Angat river, just below its confluence with the Ipo river. The river widens out at this location, thus providing sufficient spillway capacity over the crest of the dam, and as in flood stage the river is likely to carry over 200,000 cubic feet per second, the provision of a capacious spillway is imperative. The rapids in the river at this point indicate that good foundations will be available at an economical cost. The borings made at this place indicate that the Andesite rock in the vicinity is sound, and besides affording good foundations will supply good building material for the construction of the dam and its appurtenances.

The design of the dam is extra massive as it may have to carry a depth of 30 feet over its spillway. The fact that it is located in a country subject to occasional earthquakes could also not be lost

Chief Engineer Inspecting Possible Dam Sites and Shooting the Rapids on a Bamboo Raft

sight of. The width of the river would facilitate construction as the coffer dams can be built at reasonable cost. The following are the dimensions of the dam as per preliminary design :—

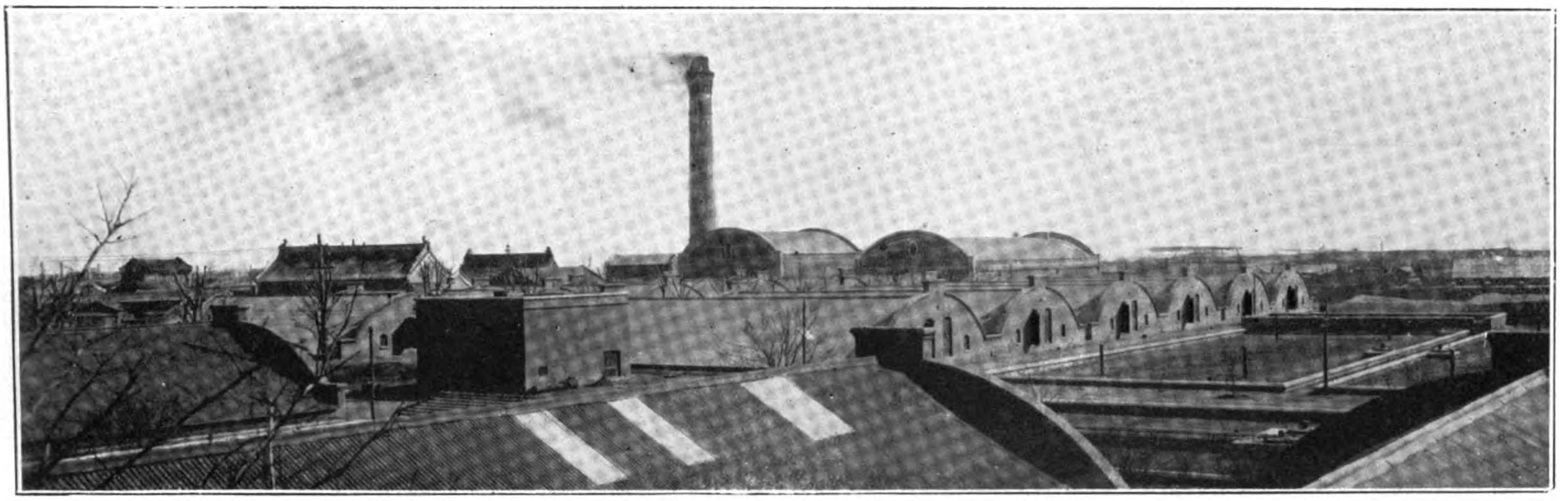
Height of dam above river bed	56 feet
Estimated depth of foundations	10 ,,
Total estimated height of dam	66 ,,
Length of dam at top	500 ,,
Length of dam at river bed	262 ,,
Width of dam at top	20 ,,

Tunnels.—From the intake at the dam, the water is carried by a tunnel of a capacity of 80,000,000 gallons per day, or about 125 cubic feet per second, for a distance of some 17 kilometres to the

(Continued on page 335.)

Hospitable Country Folk Afford Engineers a Welcome Rest on the Trail

Junction of Ipo and Angat Rivers Finally Chosen as Site for the Dam

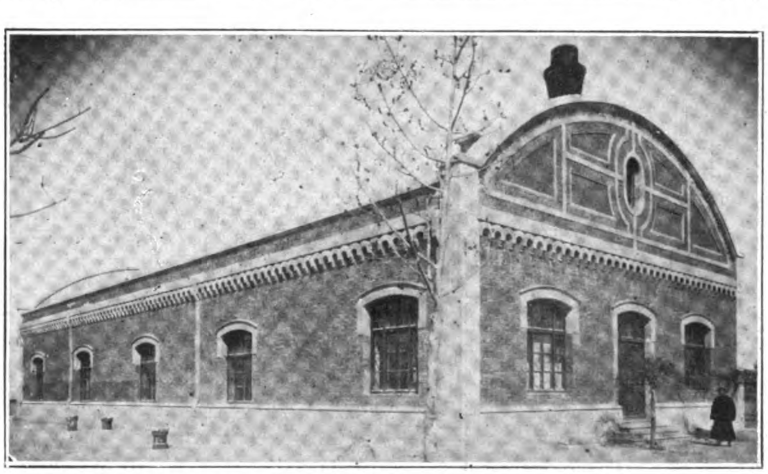


General View of the Tientsin Native City Waterworks Plant

Tientsin's Water Supply

THE Tientsin water supply was established in 1897 by a private company with an authorized capital of Tls. 200,000 using the water from the Haiho River. With the rapid growth of the British concession, however, the company failed to keep step and when its franchise expired in May, 1922, it was taken over by the council and operated as a municipal enterprise.

The waterworks plant is situated on about twenty *mow* of ground near the centre of the old concessions, Parkes, Gordon and Davenport roads. It draws water from intakes in the Haiho River at a present normal rate of 750,000 gallons daily, with a maximum capacity of 1,000,000 gallons. During the past year the maximum daily intake was 818,000 gallons on September 13, while the minimum fell well below the normal figure. The present normal rate of output is also 750,000 gallons with the same maximum capacity of 1,000,000 gallons. The highest maximum daily output for the past year was 673,000 gallons on May 30. The pumping plant is capable of still higher capacities, approximating 1,500,000 gallons. The plant includes three settling tanks, each of a capacity of 200,000 gallons, and one of 99,000 gallons, a sedimentation basin of 500,000 gallons capacity and nine filters with total surface area of nearly 14,000 square feet. There is also an important reserve filtered water storage tank with a capacity of 500,000 gallons, always kept full for eventualities. The pumping machinery consists of three Worthington steam pumps, two of 750 and one of 500 gallons per minute capacity, two Mumford pumps, each 250 gallons capacity, one Babcock and three Cochrane marine type boilers. The intake pumps are three steam engined centrifugal pumps, each of a normal capacity of 1,000 gallons per minute. The maximum capacity of the intake is 60,000 gallons an hour, one pump working, the other standing by.



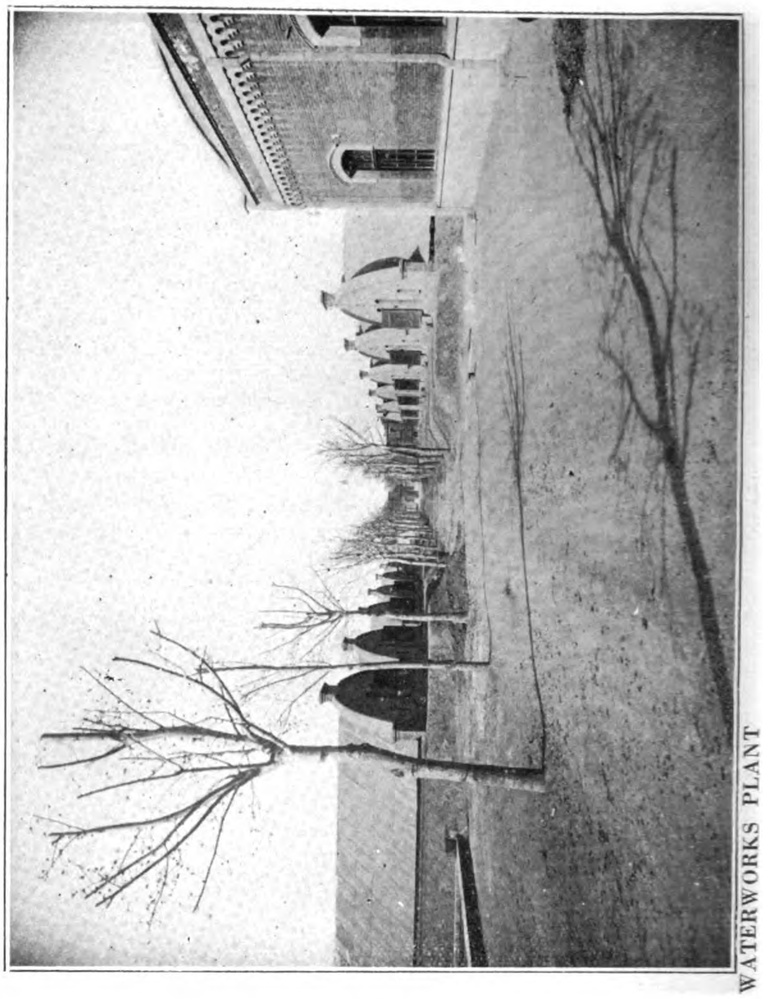
Tientsin Native City Waterworks: Top, Boiler House and Chimney; Bottom, Engine House

The normal outflow duty of the plant is 45,000 gallons per hour, maximum 60,000, at a pumping pressure of 37½ pounds per square inch, one pump always kept in reserve. In addition to the power outflow the water tower, ninety feet high, has a capacity of 22,000 gallons, but is now used only as a standpipe. There is also an emergency "Booster" pump, driven by electric motor, which can increase the water pressure in the mains to 50 pounds per square inch. This booster is turned on at the heavy "draw-off" periods of the day, at present between 7 and 10 a.m., and whenever fires break out in the concession.

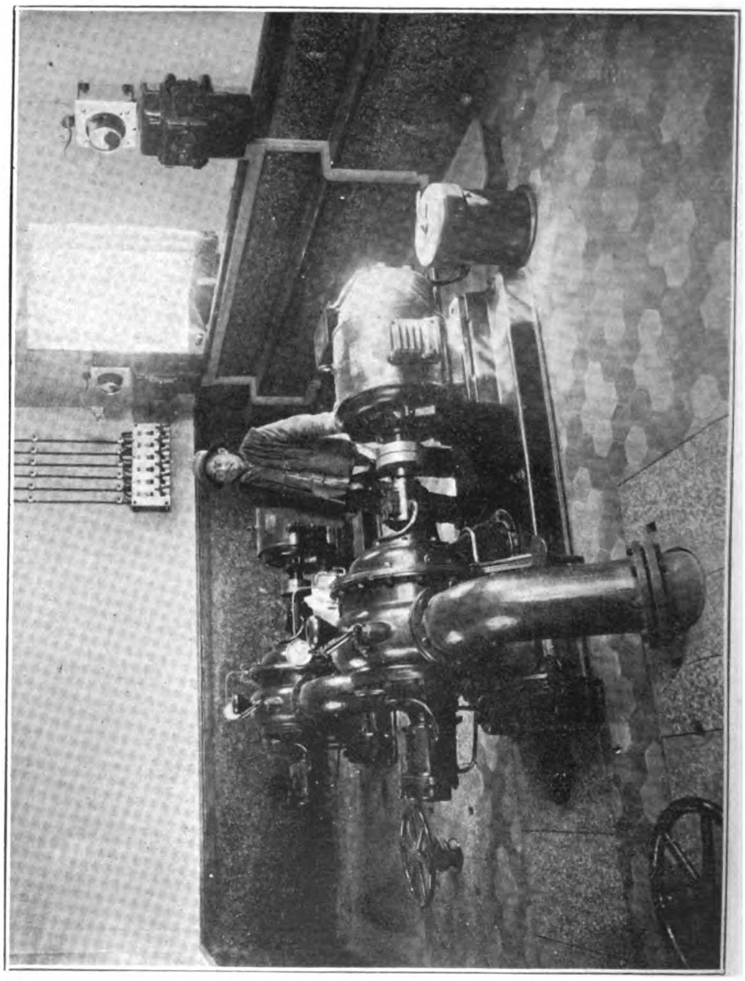
Public Water Supply Problem

One of the largest problems facing the British municipal council is the provision of water to the community, and in view of the many disadvantages of using river water, the possibilities obtaining water from artesian wells are to be tested. It can readily be understood that the chief trouble is the presence of suspended matter in water from the Haiho River, whence the waterworks obtains its supply. According to minute data drawn up by the Haiho river conservancy the quantity of suspended matter in the water varies with the season, being low in winter, when the current is slow, and high in spring and summer when thaw and rain bring freshets and, because of them, large amounts of silt and free soil. The matter in suspense accordingly varies from two to thirteen pounds to the cubic metre at the

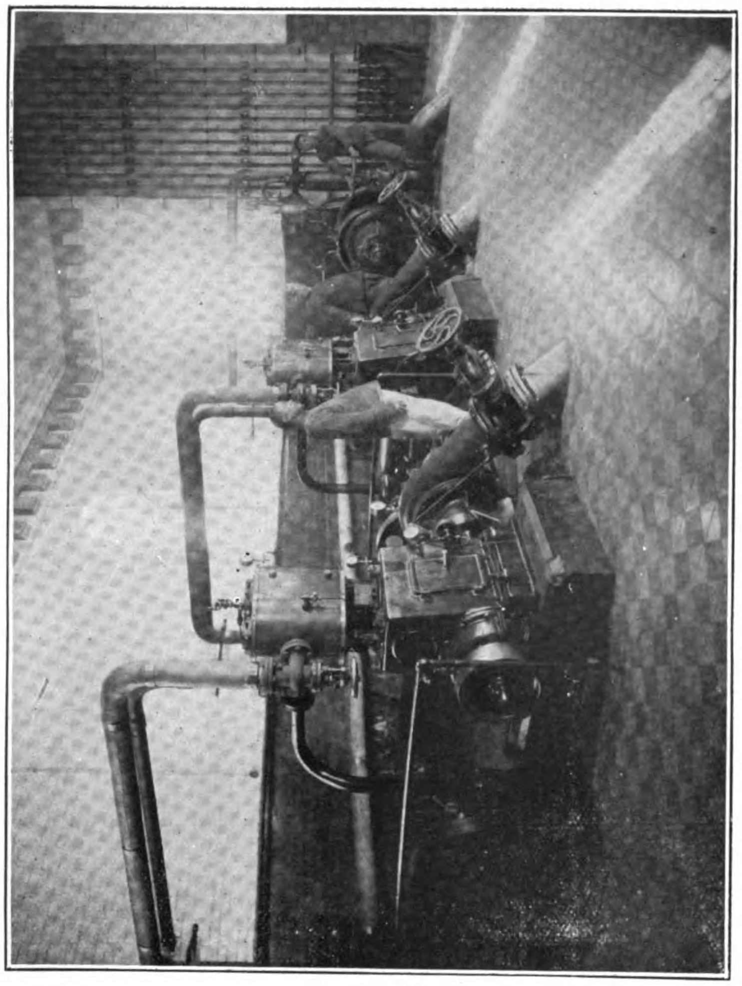
TIENTSIN NATIVE CITY WATERWORKS PLANT



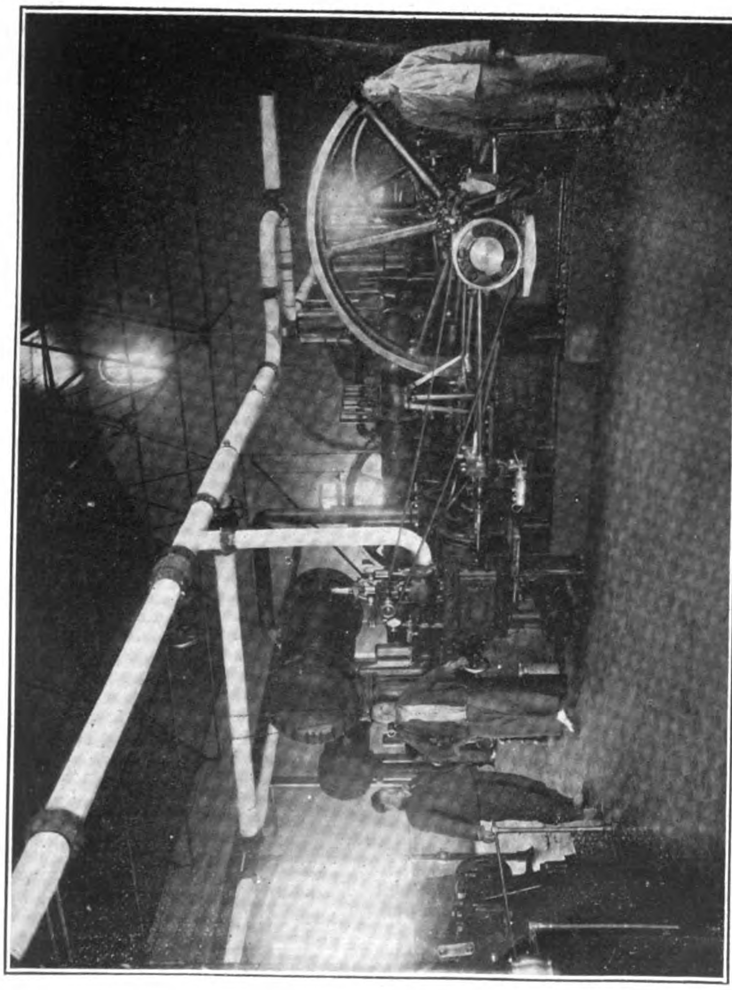
Filters



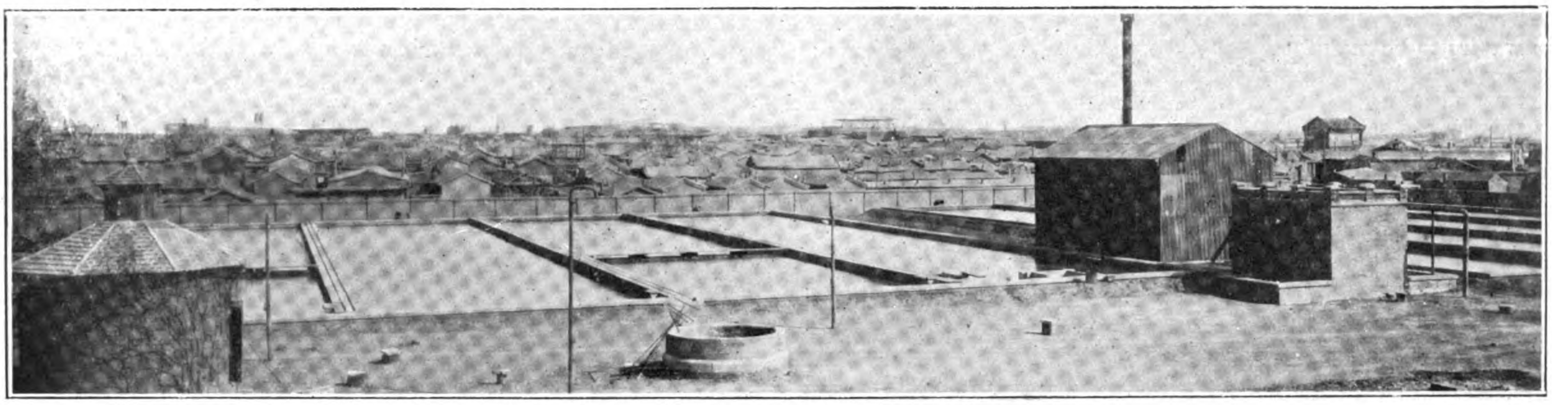
Electrical High Lift Pumps



Raw Water Pumping Machinery



Part of High Lift Pumping Machinery



Tientsin Native City Waterworks: Sedimentation Basins

surface and from five to twenty pounds to the cubic metre at the bottom. The waterworks, however, must always be prepared to deal with the highest quantities, a problem which becomes increasingly difficult by reason of the greatest demands on the plant coming when the water is at its worst.

Water is pumped from the river direct into huge settling tanks, referred to above, where it remains twelve hours to give it time to allow a settlement of a large part of its muddy burden, and to be disinfected with a solution of chloride of lime. Thence it is turned into the sedimentation basin and subsequently let into the filter beds. The filter is a layer of sand and gravel, the former two and a half feet thick, the latter six inches thick. The filter is frequently cleaned out and was entirely relaid last summer, a process which required the handling of two thousand, four hundred tons of sand and gravel. The difficulties of maintaining a pure water supply, under the circumstances, are too many and too varied to be detailed here, but they have been met and successfully overcome by the council in all except the most extraordinary situations. Such an exception was met three summers ago by a remarkably low water level in the river permitting the water to be permeated with a diagreeable effluent from native jute washing operations further up the river. In spite of the treatment and filtering water reached consumers in a discoloured and odorous condition.

Artesian Wells to be Tested

In view of these obstacles in the way of obtaining the purest water supply under all conditions the council has determined to test the possibilities of getting a public water supply from artesian tube wells. To this end they had a well bored in the grounds of the waterworks. Boring of a 12-in. tube well commenced in August 1923 and in November reached a depth of 250 feet, where a likely stratum of fine sand was reached. However, to be on the safe side, the well was deepened to 280 feet, where more suitable sand was discovered. Hand pumps being inadequate for a serious test, the waterworks installed a temporary, electrically driven pump. A comparative estimate, made recently, credits the well with a possible capacity of more than 200,000 gallons a day. Water from similar wells analysed by experts, is found to be bacteriologically pure, and although " hard " it is decidedly more suitable than river water for domestic supply. What the outcome will be of the lengthy tests planned for this well remains to be seen. It will take possibly several months to determine whether or not its water will be affected by surface seepage, and if its estimated capacity can be maintained. The results will be watched with great interest by all who have studied the prime question of pure water supply, possibly the greatest problem of communities in China. If this source of supply is found satisfactory the British municipal council will have made a remarkable step forward in the growth of Tientsin and at the same time will have contributed immeasurably to the health of both this and other concessions in this country.

The development of the waterworks keeps pace with the rest of the settlement, although the demands on it have been reduced by the severance of the French concession, which now obtains its supply from the Tientsin native city waterworks. The change took place at the end of June last year and in October 1922 the ex-German concession, hitherto supplied individually, was placed on bulk supply. The three mains leading into that concession were cut, valves and metres inserted and the supply charged direct to the administration of the ex-German concession, which makes its own arrangements with individual consumers. The growth of demand in the British concession areas is principally due to the council's compulsory sanitation, and to a large extent the development of the extra mural area. At the end of 1922 there were 574 consumers on the mains, whereas to date, in less than a year, there are 717. The past working year of the waterworks has been devoted mainly to reorganization of the old company's plant, repairs and maintenance. However, there have been several noteworthy advances, 3,000 feet of new cast iron 6-in. mains have been laid in Liscum, Parkes and Seymour roads, replacing the old steel 4-in. mains in the latter road. In regard to the Seymour Road main the waterworks achieved the remarkable record of laying more than 450 feet of 6-in. main, removing a still longer 4-in. main, inserting hydrant and stop valve all in the space of 25 working hours without interruption of service to consumers. This incident is worthy of note illustrating, as it does, the modern methods and progressive development of the waterworks under municipal control. It is a significant indication of the advance of this concession.

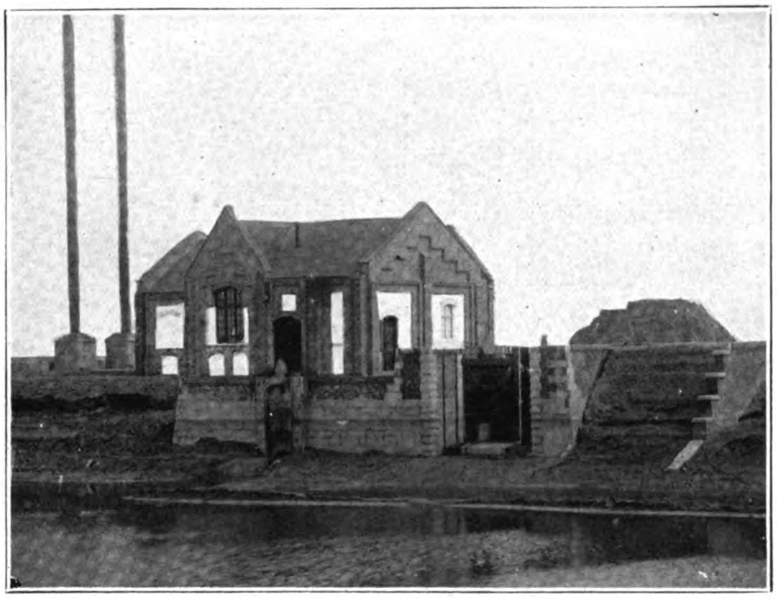
Weitze Creek Lock and Pumping Scheme

Following the floods in 1917 the need to ensure more effectively the proper drainage of the concession was considered extremely pressing. Passing as it does diagonally north and south through the approximate centre of the Japanese, French and British concessions, the Weitze creek, a tidal waterway, forms a most desirable means to that end. Passing on through the northern end of the ex-German concession the creek enters the Haiho river, but its

Tientsin Native City Waterworks: Underground Clean Water Reservoirs Surrounded by Filterbeds (roofed)

waters are controlled at the mouth by a lock gate, which enables its waters to be maintained at a desired level. In considering this idea of using it and improving its features as a drainage for flood, storm and effluent waters, the Chihli river commission were first approached to see if they would undertake the matter in connection with the flood relief bureau. This suggestion, however, was not accepted and in 1918 the British, French, Japanese and ex-German concession municipalities decided jointly to carry out a scheme whereby the concession areas would be drained into the creek and a pumping installation erected at the Haiho end of the creek. The pumps were to control the water level and permit frequent flushing to maintain thorough cleansing. At a meeting of representatives of the several councils it was decided that the capital outlay would be shared in proportion to the area drained in each concession, and that the subsequent running expenses would be borne in equal parts. The matter was then investigated further with the assistance of experts and considerable correspondence entered into with the Chinese authorities. The outcome of this was the decision, in 1920, of the Civil Governor, Tsao Jui, to permit the committee of representatives of the four areas to control the whole scheme, and to purchase the necessary pumping installation. The original capacity of the machinery was increased, the deepening of the creek entered upon and the pumping plant finally received and erected ready for use last summer. In the meantime the erection of another lock at the Haikwanssu end of the creek was found necessary in order to shut off tributary waters and enable the creek to be pumped out, an operation which would require, with the pumping capacity, a mere three hours. It could then be automatically flushed by opening the lock gate at the river end. The Haikwanssu lock was constructed and everything made ready to commence last summer with an official trial. The concessions' drainage was diverted into the creek over the intervening period and the creek excavated to the required depth. However, no official trial took place, owing to the question of control of both locks, and the matter is now at a deadlock. The machinery and locks, costing Taels 160,000 are idle, the creek is becoming offensive to the smell and householders in the vicinity are becoming impatient.

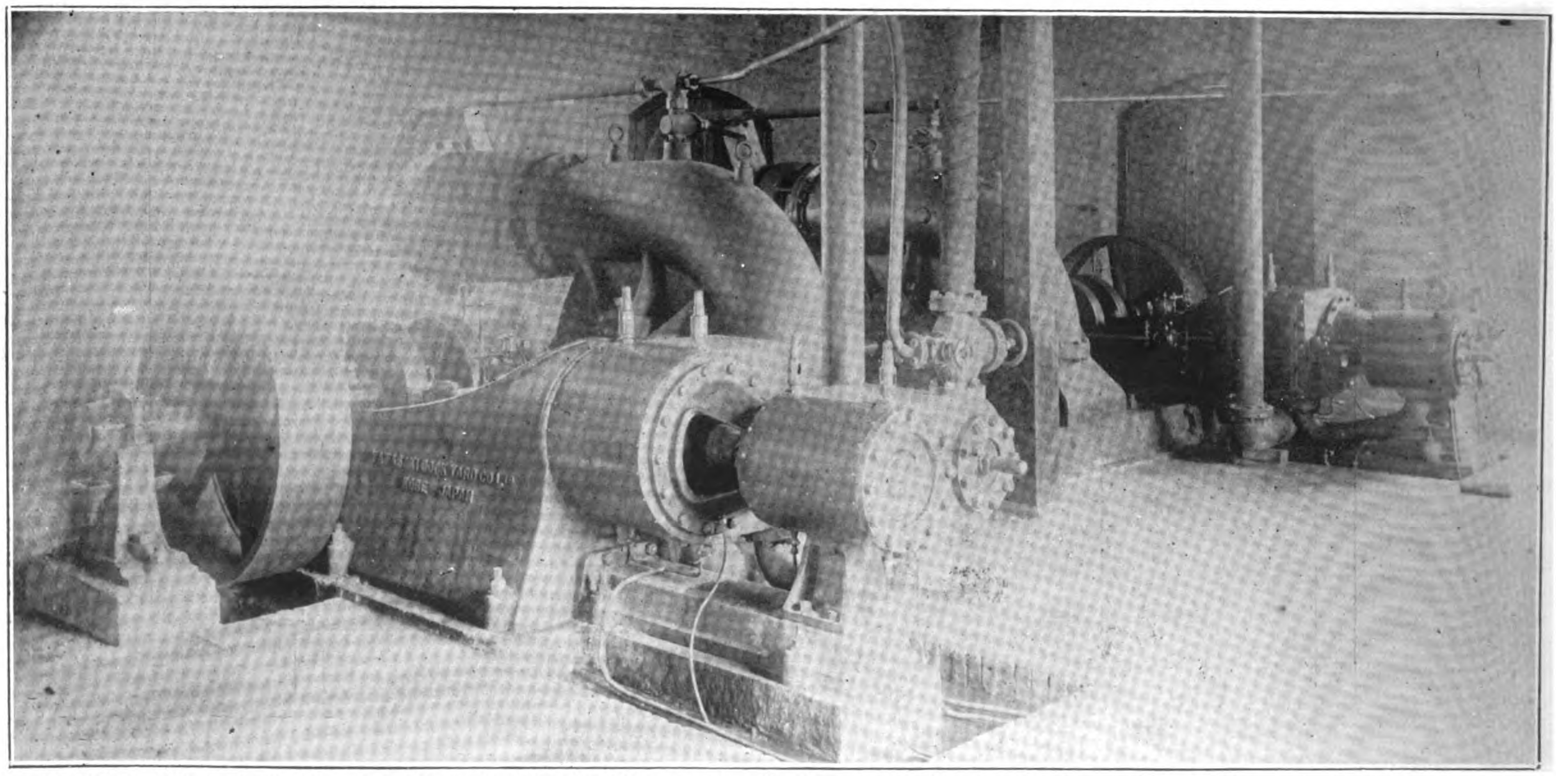
Thus, one of the most comprehensive and far-sighted schemes undertaken and accomplished by the British and other concessions in co-operation, is awaiting its final consummation. The extent of the plan can best be gauged by the effectiveness of its machinery, for the pumps are capable of emptying ten million gallons of water in three hours.



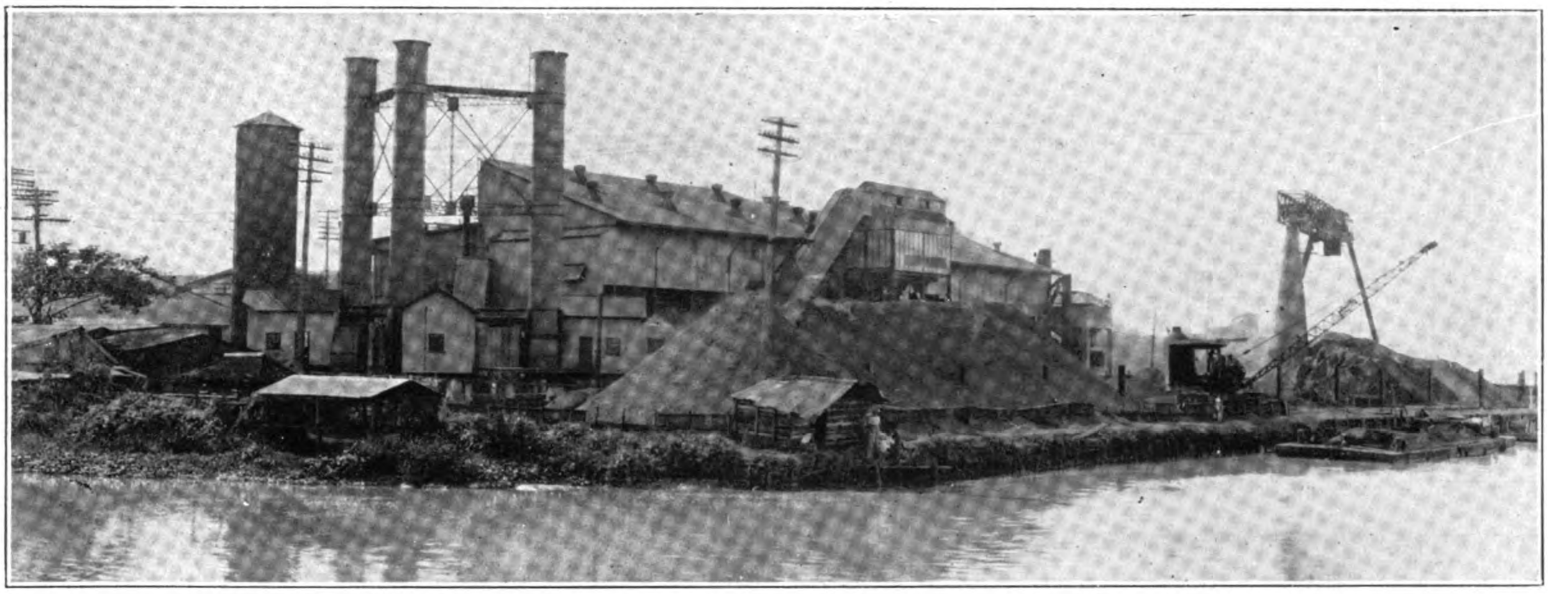
Tientsin Native City Waterworks Company

For the Chinese city as well as the French, Russian, Italian, Japanese and ex-Austrian concessions at Tientsin, the water is supplied by the Tientsin Native City Waterworks Company, Ltd. This company was established in 1901 with a capital of Tls. 1,500,000 and has debentures of Tls. 200,000 outstanding. This plant is undoubtedly one of the largest and best equipped in China, serving a population of 810,000 in the Chinese city alone. It has a maximum intake capacity of six million gallons a day and a maximum filtered water output capacity of four and a half millions, with a present normal output of three million gallons. The largest quantity supplied on one day in 1923 was on July 2, the output reaching the total of three million five hundred thousand gallons. The maximum pumping capacity of the entire plant is six million gallons a day, with a normal capacity of four and a half millions. There are twelve settling tanks of a combined capacity of two million gallons, two sedimentation basins of four million gallons combined capacity, thirty-one filters of a total capacity of four and a half millions and two reserve filtered water tanks containing a constant capacity of one and a half million gallons.

(Continued on page 323.)



The Original Pumping Station of the Tientsin Municipal Waterworks: Equipped with Pumping Machinery from the Kawasaki Dockyard Co., Ltd., of Kobe, Japan



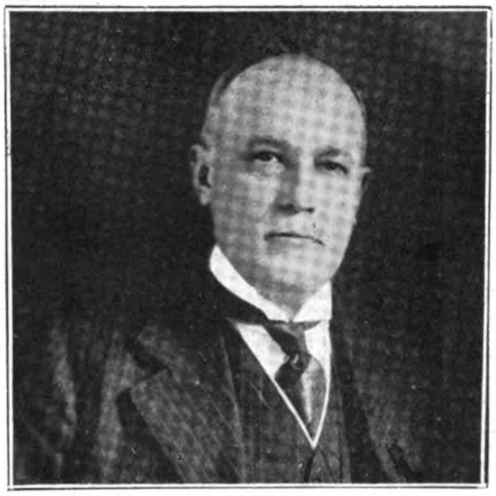
Plant of the Manila Electric Company showing Coal Handling Machinery and Storage Yard

Manila Electric Company

New Investments Show Faith in Philippines

THE Manila Electric Company is one of the pioneer American enterprises in the Philippines, and represents the largest single investment of American capital in the islands. In 1903 Mr. Charles M. Swift obtained a fifty-year franchise from the city of Manila for the operation of an electric street car system and the sale of electric light and power. At this time the "Compania de Tranvias de Filipinas" operated a line of horse-drawn cars through certain sections of the city, and "Compañia La Electricista" operated an electric plant of 1,000 H.P. capacity.

Mr. Swift transferred his franchise to the Manila Electric Railroad and Light Company which then purchased the "Compania de Tranvias" and later acquired the "La Electricista" interests. In 1921 the Manila Electric Railroad and Light Company was incorporated under the laws of the Philippine Islands and the name changed to Manila Electric Company. Construction of the street railway and power plant was commenced in 1904, and both were put in operation in 1905. Since that time the company has consistently kept pace with modern practices and has never hesitated to give the public the benefit of the introduction of most modern machinery and appliances.



J. H. Pardee, President of the J. G. White Management Corporation, operating the Manila Electric Company

Power Plant

The original plant was completed in 1905 with a total generating capacity of 2,250 KW., which was gradually increased to 10,500 K.W. in 1915. During 1920-22, two old units were replaced with two 5,000 K.W. Westinghouse turbo generators, which increased the capacity of the plant to 17,500 K.W. At the same time the hand-fired boilers were revamped and stokerized, increasing the boiler capacity 50 per cent.

At the present writing an additional plant is being constructed which will contain a 12,500 K.W. Allis Chalmers unit. This will arrive in July and will be in operation by October. The new plant is being constructed so that it can be extended to take three more units of this type, the installation of which will depend on the demand and the rate of deterioration in efficiency of the present machines.

The present primary voltage is 3,400, 60-cycle, two-phase, but with the installation of the new unit and completion of new transmission line this will be changed to 13,000 volts, 60-cycle, 3-phase, which will be stepped down to 3,400 at 5 sub-stations. Current is delivered to the consumer at 220 volts.

The power plant is situated on an island bounded by an estero and the Pasig River, from which the condensing water is obtained. Semi-anthracite coal from Indo-China is delivered alongside in barges and handled on to the storage pile with Brown hoist and traveling crane. A drag line scraper then delivers to the conveyer which dumps into storage hopper and thence to furnaces. The chief engineer, watch engineers, and boiler room foremen are all Americans, the remainder of the operating force consisting of Filipinos.

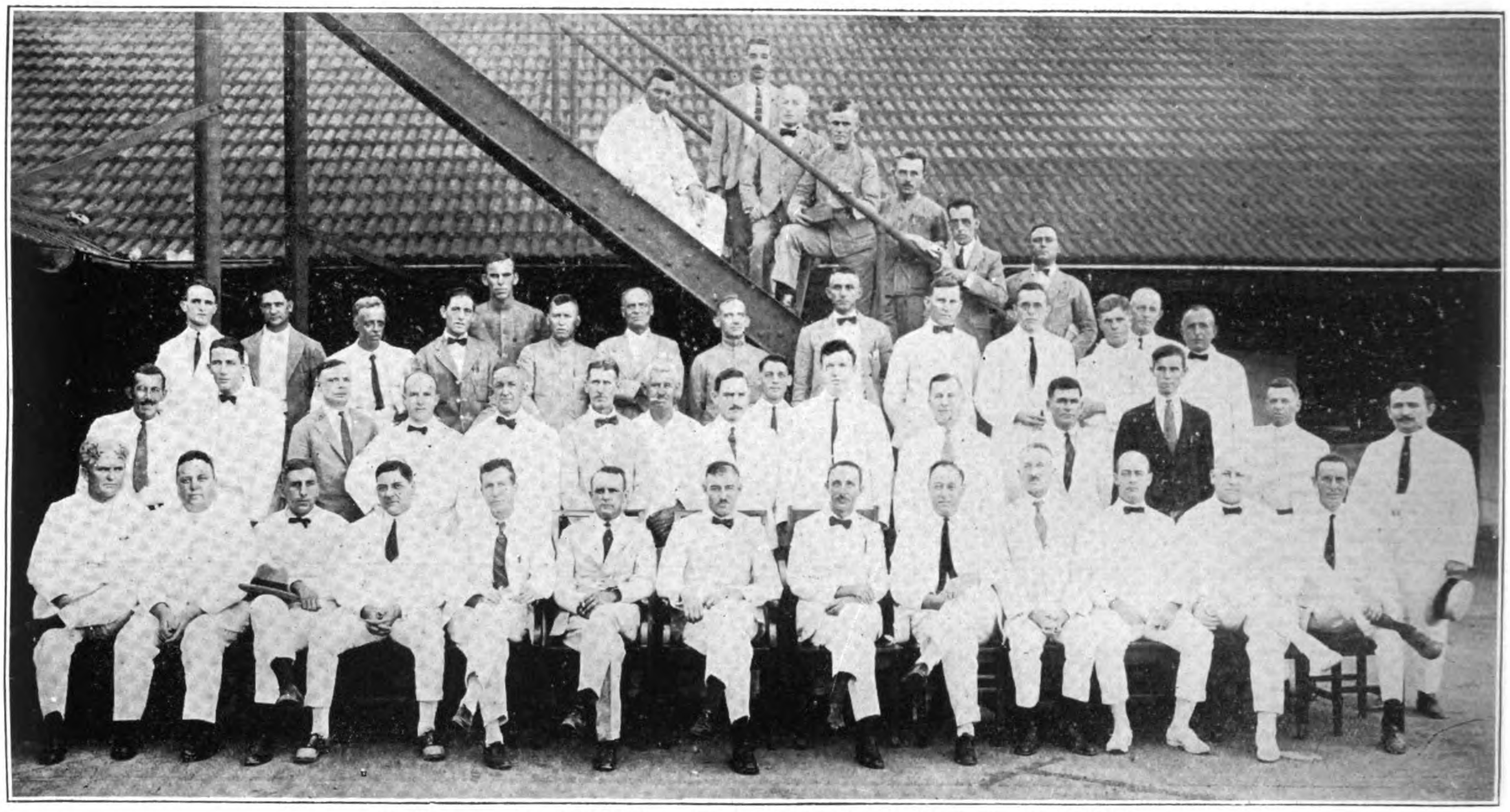
The number of electric service customers has increased from 3,478 in 1906 to 42,126 in 1923, and the present rate of increase is approximately 6,000 per year. The plant output has increased from 8,000,000 kilowatt hours in 1906 to 55,000,000 kilowatt hours in 1923. In spite of the higher cost of coal and other materials as compared to United States prices, the company has reduced its electric rates 25 per cent. and they are now on a par with the average steam generating stations in the states.

Track and Transportation

The company operates 148 passenger cars and 13 work cars over 52 miles of track throughout Manila and its environs serving a population of 385,000 people. Track is standard 4-ft. 8½-in. guage and modern standard electrical equipment is used on rolling stock with 550 D.C. trolley voltage.

Reconstruction of the old tramway tracks was started in 1904 using 5-in. T rail and 7-in. girder. Very little ballast was used and girder rail was laid in concrete on 9-ft. tie centres. In 1920 an extensive track reconstruction program was projected which is now nearing completion.

Since a large part of Manila is below tide water and the rainy season protracted, proper track drainage in most places is impossible. To compensate for this a sub-base of 13-in. of compactly rolled cinders is used under 3-in. of rock ballast. Seven inch 80-pound T rail is the standard laid on 2½-ft. tie centres. A 30-in. angle is placed under each joint and joint plates electrically welded to the rail. With the completion of this track program the Company will have increased its track mileage 25 per cent.



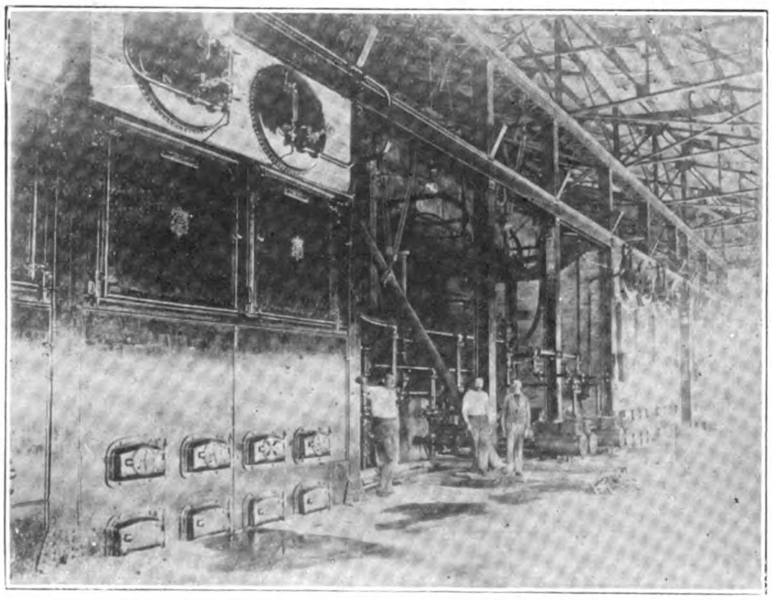
MEMBERS OF FOREIGN STAFF, MANILA ELECTRIC COMPANY

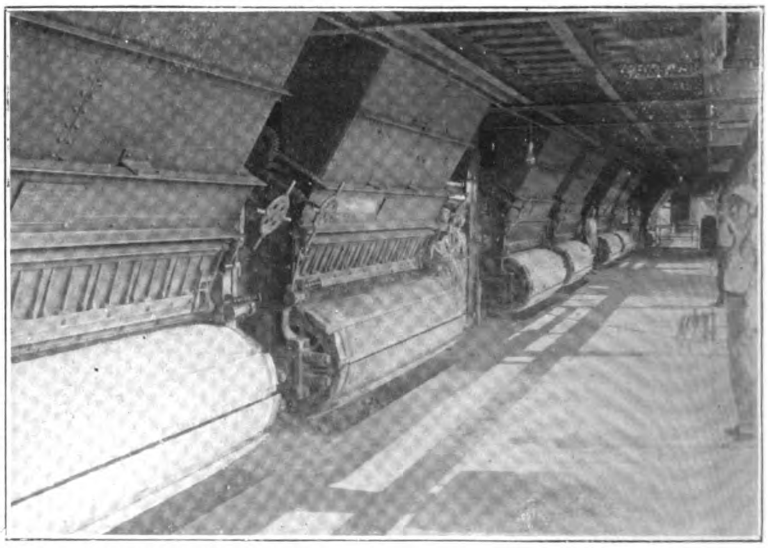
1st Row, seated, left to right: W. J. Manion, Purchasing Agent; W. A. Seton, Supt. Transportation; J. A. Thomas, Supt. Shops; J. N. Weaver, Asst. Supt. Elec. Dept.; W. H. Rudisill, Supt. Engineering; G. E. Schreiber, Construction Supt.; R. W. Spofford, General Manager; H. P. L. Jollye, Auditor; M. Toby, Engineer, Maintenance of Way; W. G. Cords, Advertising Agent; A. B. Tigh, Sec. to General Manager; H. A, Fraser, Acting Chief Engineer; F. C. Swan, Supt. Distribution Dept. *2nd Row*: B. W. Brooks, R. B. Wright, H. B. Smith, C. H. Underwood, J. A. Foote, E. R. Hartske, C. G. Johnson, M. M. Myser, R. E. Stough, G. W. Barkas, Jr., C. A. Massell, Orlie Jackson, I. Sexton, Gil Montes. *3rd Row*: C. K. Cook, R. E. Brooks, F. Hollin, F. Roberts, W. W. Dodge, H. P. Tinsley, Harry Hall, A. Filer, S. G. Green, I. Figley, E. J. Deymek, M. J. Walsh, Carl Peterson, N. Tranfaglia, A. Richter. *On Stairs*: H. E. Bures, Geo. Morris, J. O. Nicholas, C. R. Leach, J. F. Bagdanske, J. A. Abad, A. Maio.

To replace old rolling stock and equipment and with the ultimate view of standardization, the company has designed a light weight centre entrance car to seat 56 passengers. Necessary steel and equipment have been received from the states and 20 of these cars will be fabricated in the company's shops this year.

When electrical operation was inaugurated all cars were manned by Americans as there was some doubt as to the ability of the Filipinos to handle this equipment both from a physical and psychological standpoint. However, with proper training, they proved so adaptable that all American platform men were replaced with Filipinos within two years. At present there are about 600 Filipinos in the transportation department supervised by a staff of six Americans.

By a provision in the franchise, first and second class passengers must be segregated. In the " Days of the Empire " it was a rarity to see a Filipino in the first class section while now approximately only 5 per cent. of the first class passengers are foreigners. The P. A. Y. E. system has been introduced and each passenger is handed a combination fare receipt and transfer on payment of fare. This must be presented to inspectors who board cars at various points and whose duty it is to see that each passenger has a receipt. These inspectors also see to the punching of transfers as requested. Should a transfer not be desired, then this portion of the slip is torn off and fare receipt returned to the passenger. These

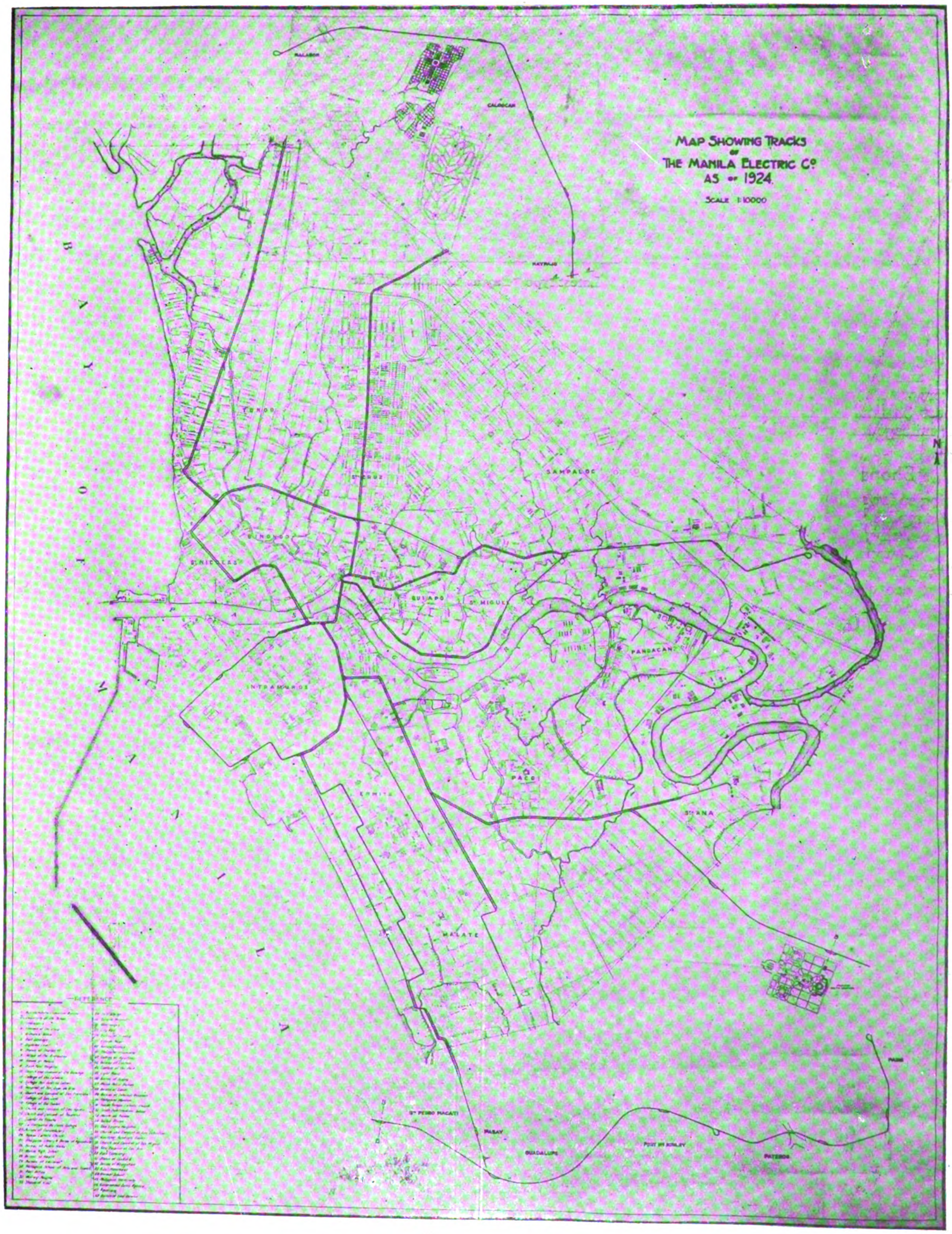




BOILER PLANT OF THE MANILA ELECTRIC COMPANY

Hand Fired Boilers, Original Plant

Present Stoker Installation


MAP SHOWING TRACKS
OF
THE MANILA ELECTRIC Co
AS OF 1924
SCALE 1:10000
BAY OF MANILA
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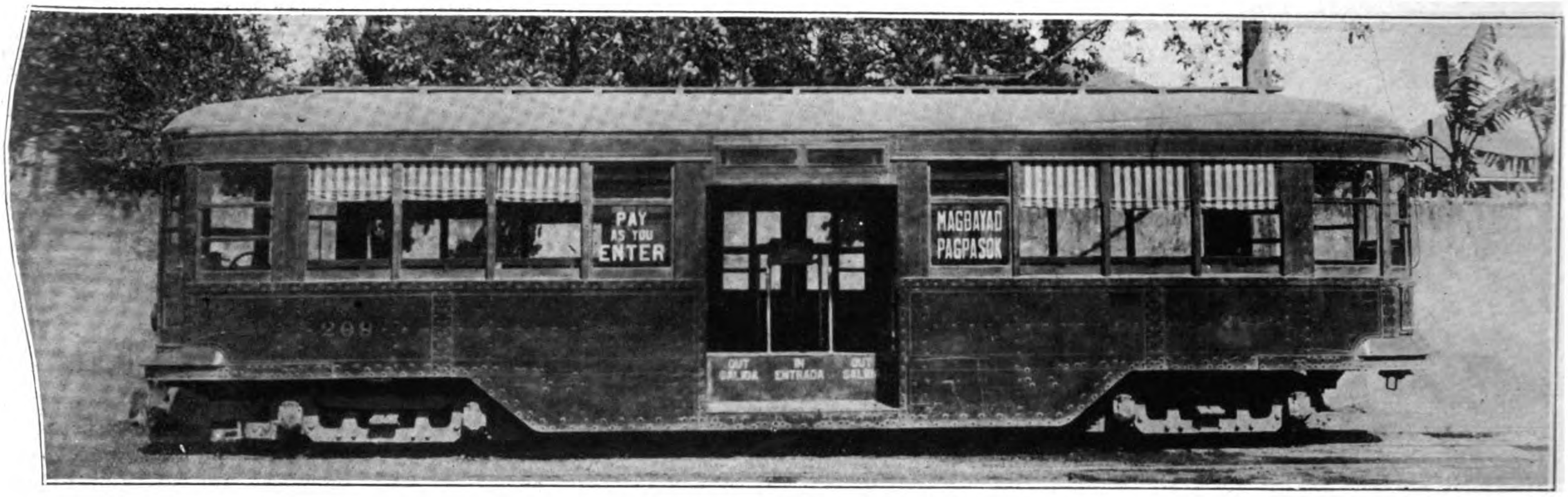


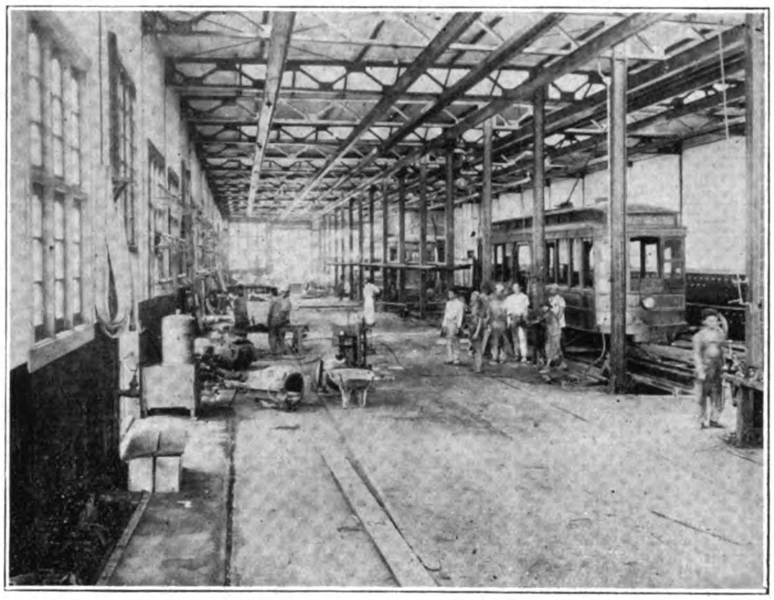
Latest type "Pay as You Enter" Car

receipts are numbered serially and the conductors turn-in is checked against their issue.

Ten and one-half million passengers were carried in 1906 as against 33½ million in 1923 and car mileage has practically doubled.

Shops

Being so far away from the base of supplies, the company must necessarily be to a great extent self-supporting. Adequate repair facilities and machinery are of the first importance for continuous service, and to this end the shops have been most completely equipped, including blast furnace and foundry. Electric welding has been successfully introduced and a very considerable saving is effected by this method in salvaging broken parts and building up worn wheel flanges. The shop force numbers 170 men all of whom are Filipinos with the exception of 17 Japanese carpenters who are employed on the higher classes of wood work.



Car Repair and Assembly Shop

Accounting Department

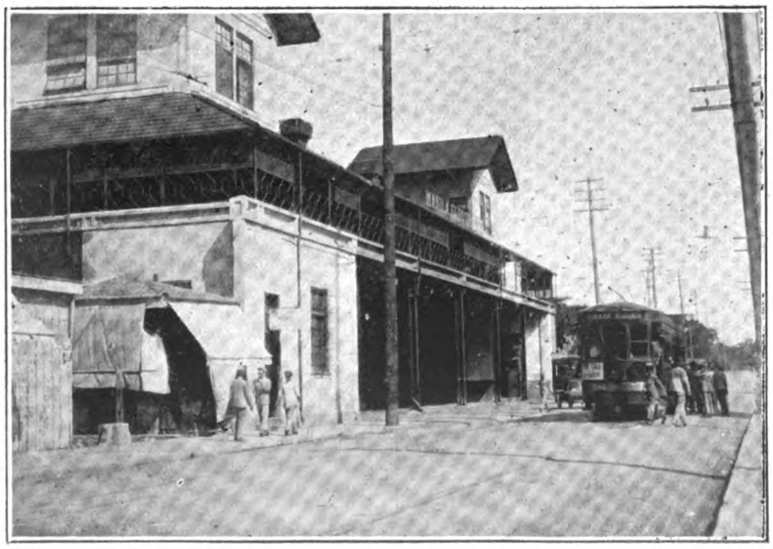
The work of this department is necessarily voluminous and is efficiently handled by a force of 187 Filipinos supervised by a foreign staff of six men.

Personnel

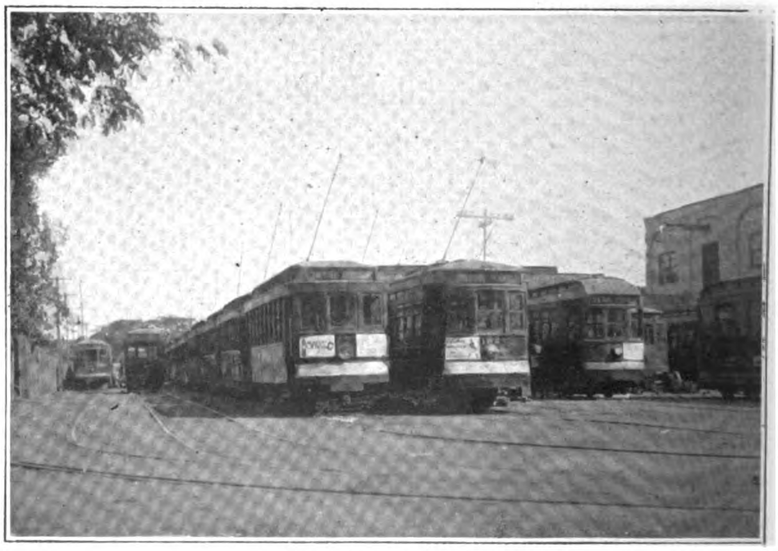
The company has been eminently successful in obtaining and retaining the loyalty of its 2,000 Filipino employees. Good wages are paid them and their health and general welfare carefully looked after by the company's doctor. The "Meralco" baseball team has won the league pennant several times and nine of its players were picked for the squad which represented the Philippines in the Far Eastern Olympiad at Osaka in 1923. A Christmas celebration is given every year at which every employee receives a present from the company.

The company's belief in the future of Manila is evidenced by the fact that $5,000,000 has been added to property account during the last ten years. This will be further increased by $2,250,000, when the new plant, track program and car building program are completed. The company's bonded indebtedness is less than half the physical appraisal of the property.

The company is under the operation of The J. G. White Management Corporation, 43 Exchange Place, New York, of which J. H. Pardee is president. The local officials are: J. C. Rockwell, vice-president and R. W. Spofford, general manager.



Car Barns and General Offices



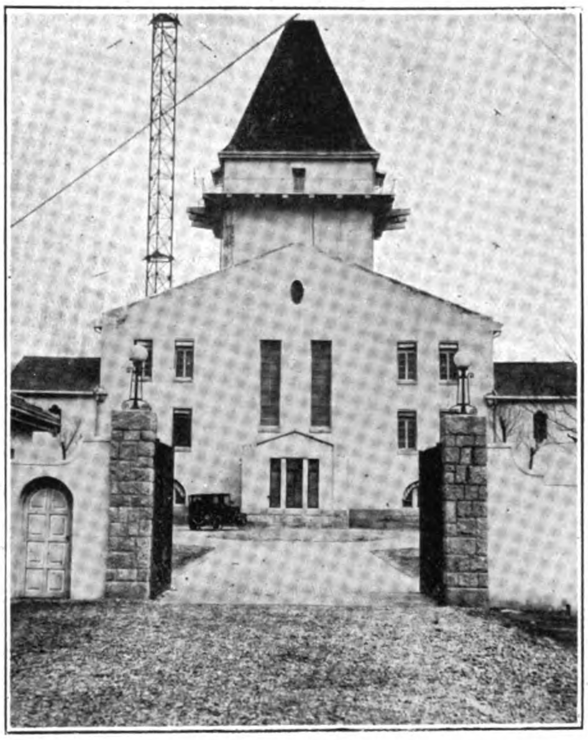
Car Storage Yard

The Shuang-Chiao Wireless Station

Mitsui Bussan Kaisha Installation Now Ready for Operation After Overcoming Serious Engineering Difficulties

THE largest radio station in the Far East has been installed by the Mitsui Bussan Kaisha at Shuang Chiao near Peking, is now ready for operation and is remarkable in that it successfully violates some of the preconceived theories of radio engineers without lessening the efficiency or transmission radius of the plant. The plant is the outcome of a contract signed between the Chinese government and the Mitsui firm in February 1918, but the original design, owing to many improvements in radio apparatus, has had to be revised several times from the original scheme as proposed by a Danish engineer. Many difficulties in obtaining necessary structural materials for the construction of the masts were finally surmounted by the energy of the contractors who were hampered in considerable degree by the opposition created by their desire to change the original plans to give China the best possible radio installation for the money to be expended.

In the first place, Peking has no power plant to deliver the requisite amount of energy to the station, so the contractors decided to put in a turbine engine directly coupled to the high frequency generator. Immediately a storm of criticism arose from radio experts who pointed out the difficulty of changing the frequency of the current to give the desired wave lengths. They said that no directly coupled turbine plant possibly could have the flexibility required for such changes as were assumed to be needed by the station as it was to be a link between China and America and Europe, to say nothing of the nearer receivers such as steamer installations and others throughout the Far East using various wave lengths. This problem has been solved so successfully that the new station does not interfere in the slightest with others when transmitting at wave lengths differing but little from those of other radio plants.



Despatching Office

No high frequency generators of such a capacity then existed. The capacity of the Alexanderson's generators, to which type the M. B. K. generators belong, was limited to 200 K. W. and larger ones were deemed impracticable by the original maker. Thus it was thought it would be quite impossible to manufacture a larger one in Japan, where engineering facilities were made light of without realizing what rapid progress had been made in recent years. Now there is no scope for discussion as whether 500 K.W. high frequency generators of this type are practicable or not, for they do exist in this station and are working successfully. Speed control has been so successfully surmounted that the regulator works to the thousandth without difficulty.

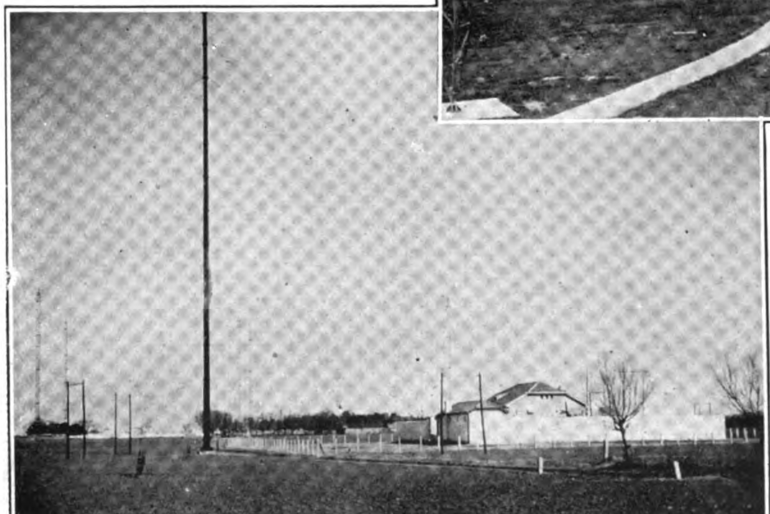
The important advantages of the new system can be summarized as follow :

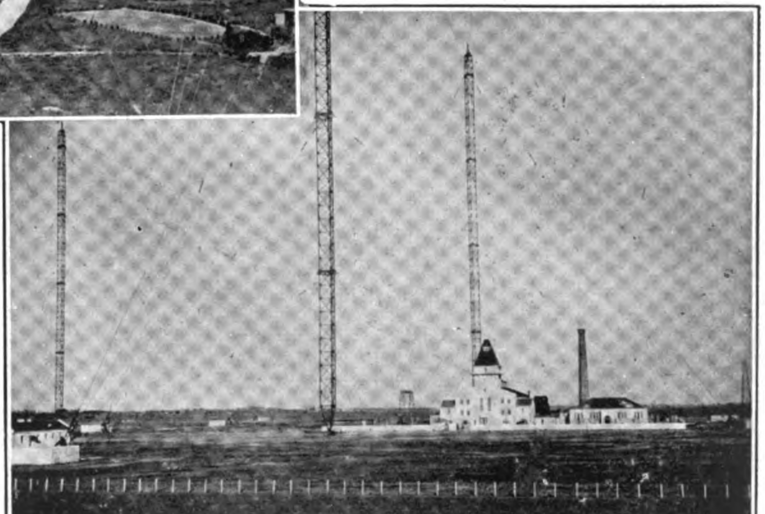
1. That the operator can easily change the speed of the turbine to produce the most convenient wave length for communicating purposes.

2. That it reduces the coal consumption for the reason that there are no superfluous machines to be used, either as generators or motors for power source, which naturally lower the efficiency.

3. That it saves expense in construction and of maintenance by reducing the number of machines.

In addition to the above-mentioned 500 K.W. turbo-generators, which are the most remarkable equipment of this station, there are many excellent machines all of the latest type and all manufactured in Japan with the exception of the boilers. The





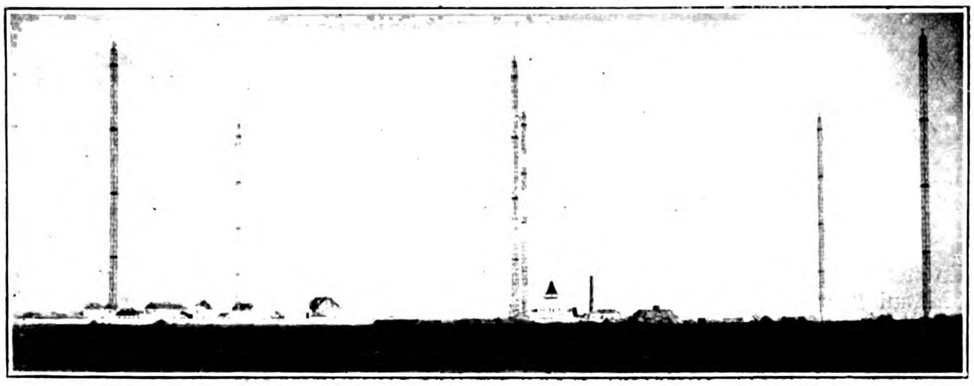
SHUANG-CHIAO WIRELESS STATION

Top: Residential Quarter

Despatching Quarter

Receiving Office

engineering of radio telegraphy is in the course of rapid progress, the latest type at present becoming out of date to-morrow; it was, therefore, deemed inadvisable to adhere to old and obsolete types. Although the new machines were designed according to the latest types, still there appeared some minor details which were capable of improvement, and this was especially apparent after the communication test had commenced. Such defects have now been remedied and the station has attained a perfection which has been apparent to radio engineers who have visited the station.



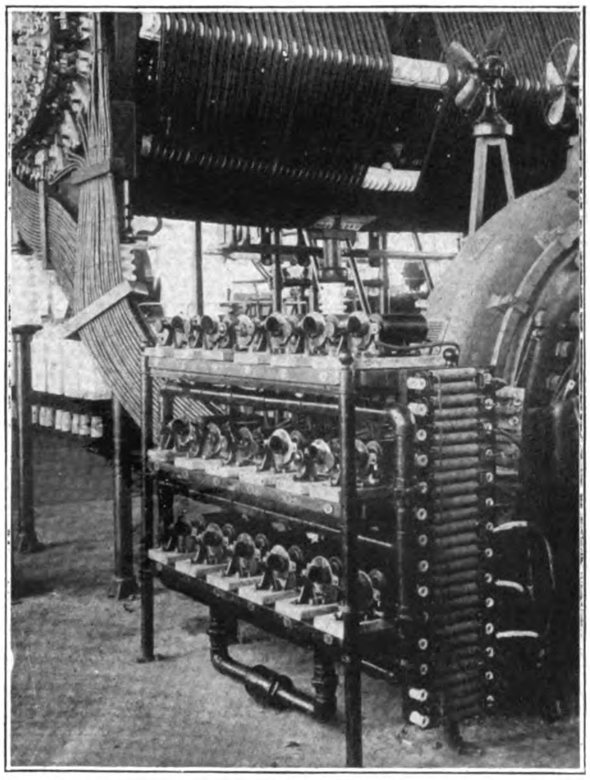
Main Office and Residence

1. Location and Site.—The station is located about eight miles east of Peking, and near Shuang Chiao, an intermediate railway station on the Peking-Tungchow branch of the Peking-Mukden line. It is within about thirty minutes' reach of the Cheng-Yang-Men station by train or by motor car.

The site comprises an area of about 150 acres (about 1,100 *mow*) including the No. 2 receiving station and the roads. There is a light railway connecting the radio station to the railway depôt for the purpose of conveying heavy material.

2. Buildings.—All the buildings of the station are of brickwork and consist of the following parts :—

The main building is five storied, containing 10 office rooms and two halls, *i.e.*, a transmitting and a boiler room. Attached to the above are a spacious storage battery room and a repairing workshop. The No. 1 receiving station is annexed to the main building by a passage, while the No. 2 receiving station is located about one mile west of the main building. Around the main building there are a coal storage, godowns, and a large and a medium-sized cooling pond.

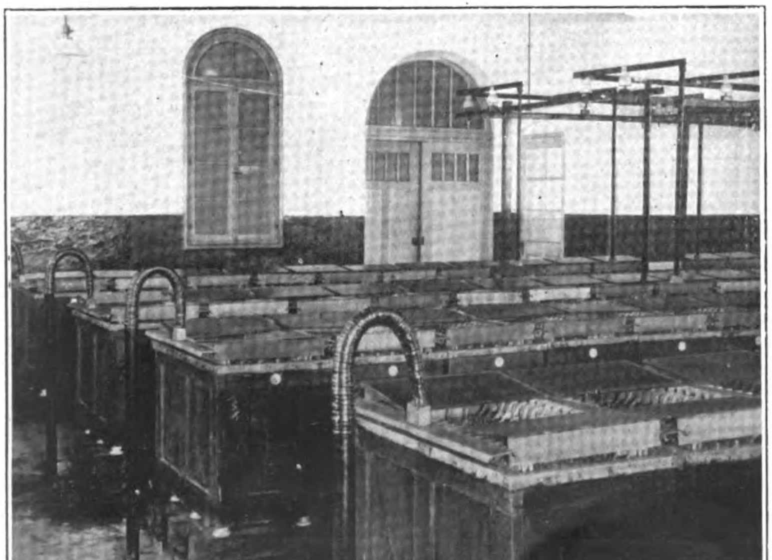


Tesla Coil and Relay Keys

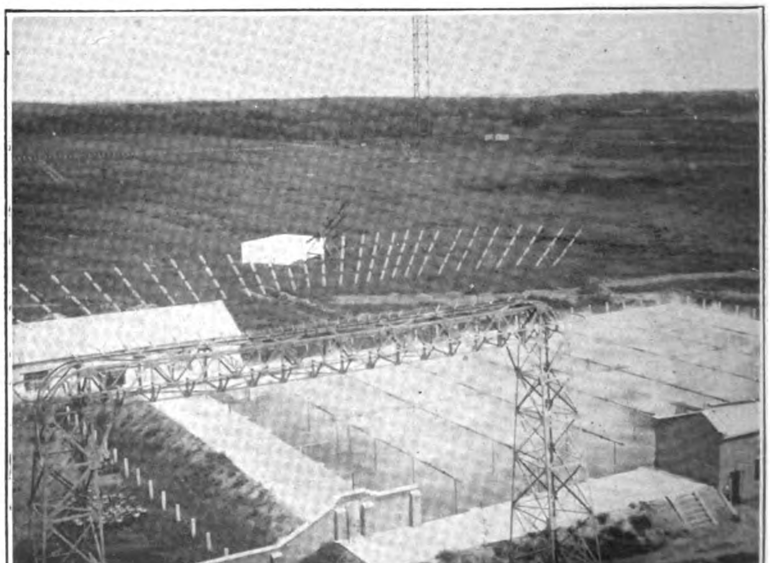
The residential buildings consist of a club, the houses of the superintendent and the chief engineer, Nos. 1 and 2 tenement houses, bachelors' quarters, bungalows for servants, a shed and two storehouses.

3. Main Equipment.—All the station is of the latest type and has many points worthy of description from the point of view of radio engineering. There are three large steam boilers manufactured by the Babcock and Wilcox Co., one being a spare. Two sets of 500 K.W. radio frequency generators manufactured by the Shibaura Engineering Works, Tokyo, are installed, each driven directly by a 1,000 H.P. Parson's steam turbine manufactured by the Mitsubishi Dockyard, Nagasaki, one of which serves as a spare. It is also possible to make a parallel running of these two sets to get 1,000 K.W. if necessary. Each turbine has two sensitive governors and three ingeniously designed load compensators, these arrangements enabling the speed variation of the turbine to be kept within one thousandth of a revolution. Though the governor has an appearance similar to that of ordinary power service, by changing the inlet-path of steam by the centrifugal force of flyballs, it contains such delicate mechanism as an oil-filled dashpot and a floating fulcrum in order to obtain a constant speed

There exists, however, some time-lag in the action of a governor, and it does not work instantly according to a sudden change of speed due to a sudden change of load. The load compensator makes up for this sudden change of speed caused by the sudden change of load, and keeps the speed regular and constant by opening and closing the auxiliary steam-path according to the sending signal. The 500 K.W. high frequency generator has a rigid construction capable of running

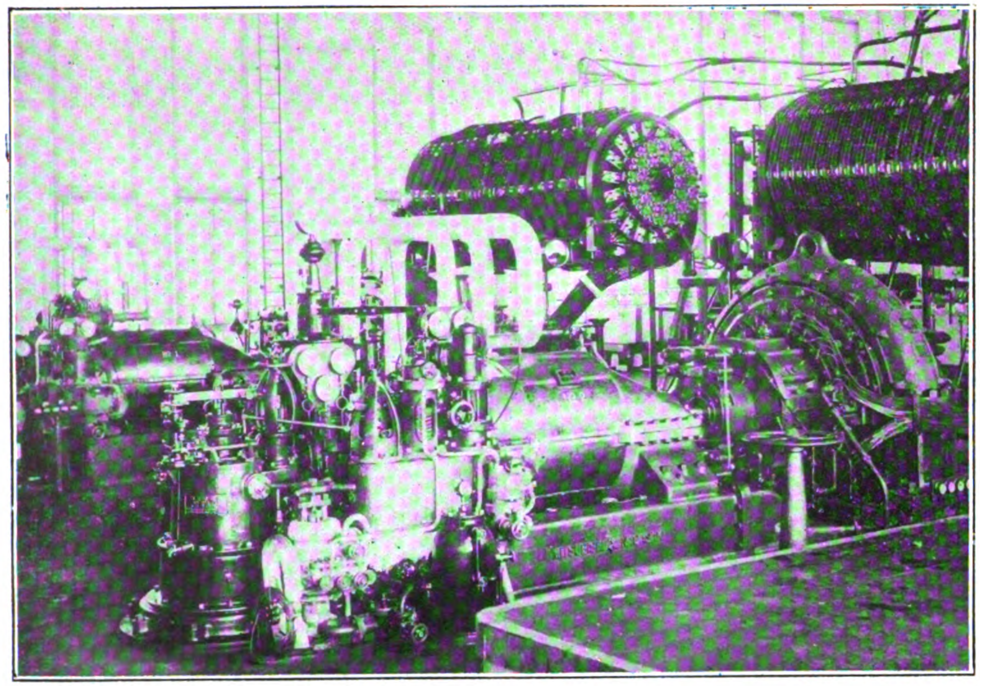


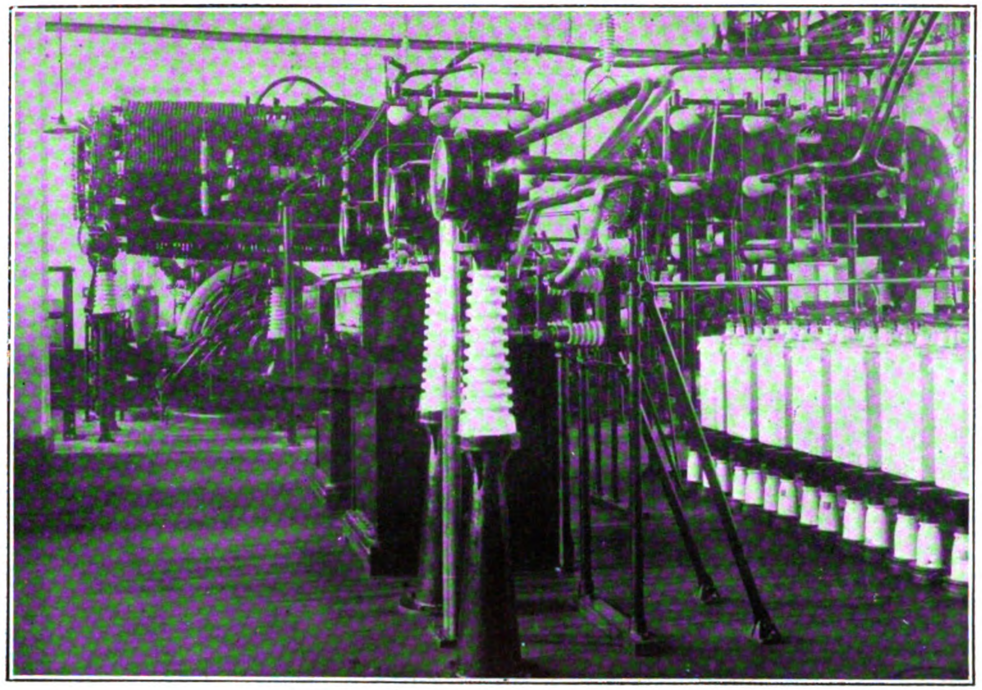
Battery Room

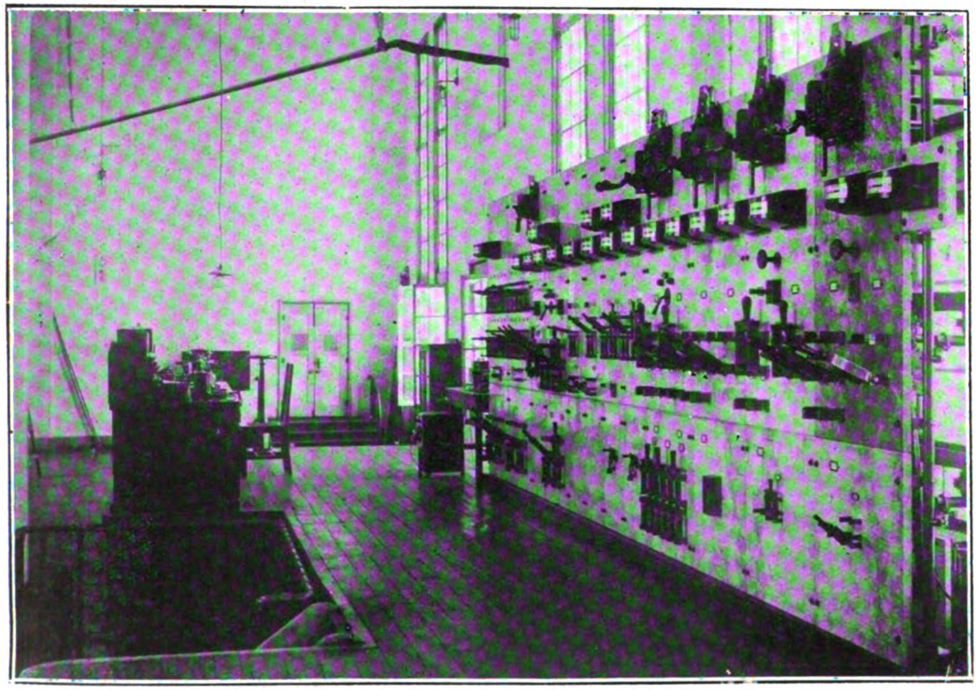


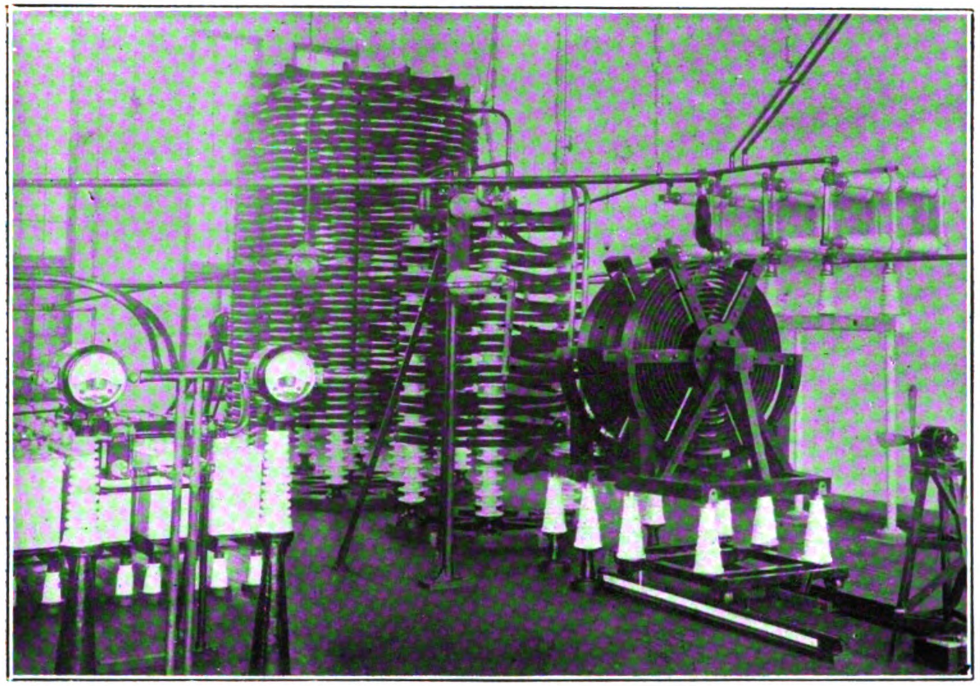
Cooling Pond

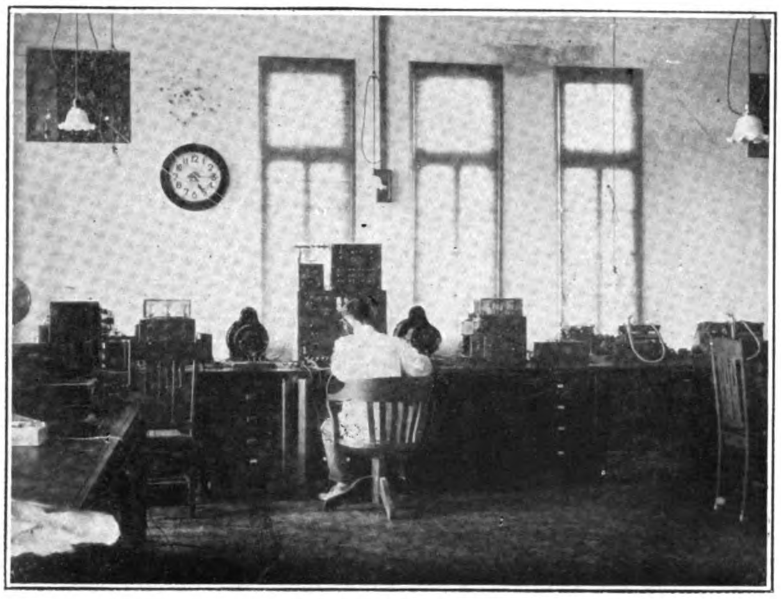
THE SHUANG-CHIAO WIRELESS STATION NEAR PEKING—Erected by the Engineering Department of the Mitsui Bussan Kaisha


No. 1 and No. 2, 1,000 H.P. Turbine and 500 K.W. High Frequency Generator

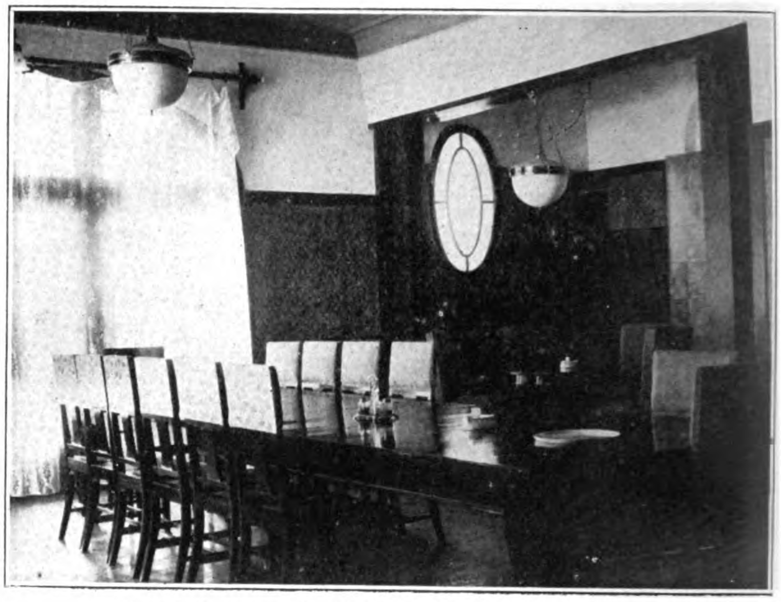

No. 2 Generating Room, West Station


No. 3 Generating Room, West Station


No 1 Generating Room, West Station



1st Receiving Room



Dining Room at the Club in the Residential Quarter

over 3,600 revolutions per minute, the peripheral speed of its rotor being about eleven miles per minute. It is designed to generate electric power at 20,000 cycles per second or 15,000 metres in wave length, but the operator can readily change its frequency or wave length as desired within a certain limit. This is one of the most remarkable advantages of the equipment, and is a point deserving of particular mention. There are two sets of 120 K.W. dynamo-engines supplying direct-current to the fields of the high frequency generators, controlling devices of antenna current, motors, storage batteries, lamps, etc.

There are 125 storage cells, the capacity of which is 2.052 ampere-hours each. The electric supply from the high frequency generator produces, through a Tesla coil, a variometer, and two inductance coils, high frequency oscillating current in the antenna to radiate electric waves into the surrounding space. In order to modulate antenna current according to signals, mechanical keys working through several intermediate relays are used for short-circuiting the armature coils of the high frequency generator, besides, antenna-inductance changing devices working electro-magnetically, are also used for that purpose. There is also a set of frequency changes doubling the frequency, *i.e.*, a device to reduce the wave length of emitted wave into half that of the generator.

Antenna towers, six in all, are of steel lattice-work, triangular in shape, and stayed in three directions, each 210 metres in height and 208 tons in weight. The antenna wires are fastened over these towers in "T" type, their width being 250 metres in the middle, 430 metres at the ends, and their length being about 1,000 metres. The earthing system consists of copper wires buried underground and connected through small coils to aerial wires supported about 12 feet above the ground, so as to obtain equal distribution of current throughout the ground wires.

When sending signals, enormous current flows through this big antenna and gives strong signals to America and Europe, so as to enable communication with them either by day or night.

Receiving antennas are built at the ground of No. 2 receiving house and are connected with the No. 1 receiving room by cable, thus enabling us to receive messages through either of them. In the receiving rooms, receivers of the latest type with automatic high speed sending and receiving apparatus, are provided.

Results of Tests

It was in July, 1923, when the installation was completed, that the station commenced communication tests with European and American stations within the transmission range of this station, and the results have been quite satisfactory.

The important stations, within the transmission range of this station, and their distances follow :—

Name of Station	Distances from this station in nautical miles.
Nauen (Germany)	3,992
Ste. Assise (France)	4,444
Bordeaux (France)	4,697
Darnavos (England)	4,436
Bolinas (U.S.A.)	5,104
Haranomachi (Japan)	1,139

With the Nauen, the Ste. Assise and the Bordeaux stations, we can easily establish communication either by day or night. Strong signals can also be given to the stations of the Radio Corporation of America in the United States, and those of the Marconi Company in England. It is superfluous to say that this station will play a most important rôle in the service of international communication when it is opened to the public.

The Eastern Railway's Traffic

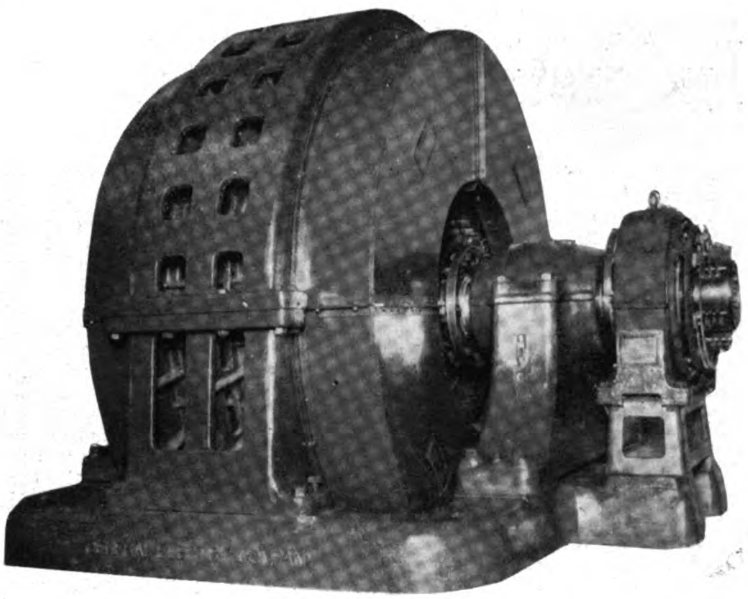
OWING to the present contention over the Chinese Eastern Railway its traffic may be of interest. Goods transported over the Railway in 1923 totalled almost twice the amount transported in 1920. Following are the figuress showing the increase in the last four years as compiled by the Chinese bureau of economic information :—

1920, 93,700,000 pounds 100 per cent.; 1921, 124,800,000 pounds 133 per cent.;

1922, 151,500,000 pounds 162 per cent ; 1923, 171,500,000 pounds 183 per cent.

Increases in the important items are hereunder classified (in millions of poods) :

	1920	1921	1922	1923
Cereals	60.0	82.5	94.4	109.5
Bean oil	0.4	0.4	1.2	1.6
Coal	8.6	9.1	12.9	15.2
Salt	1.6	2.2	3.8	4.0
Firewood	3.3	5.1	6.3	6.2
Lumber	3.6	4.9	8.8	11.7
Meat	0.5	0.5	1.5	1.7
Hay	1.1	1.2	1.9	1.9
Building materials ..	4.1	5.5	6.2	3.4
Other cargo	10.5	13.4	15.2	15.8
Total	93.7	124.8	151.5	171.5

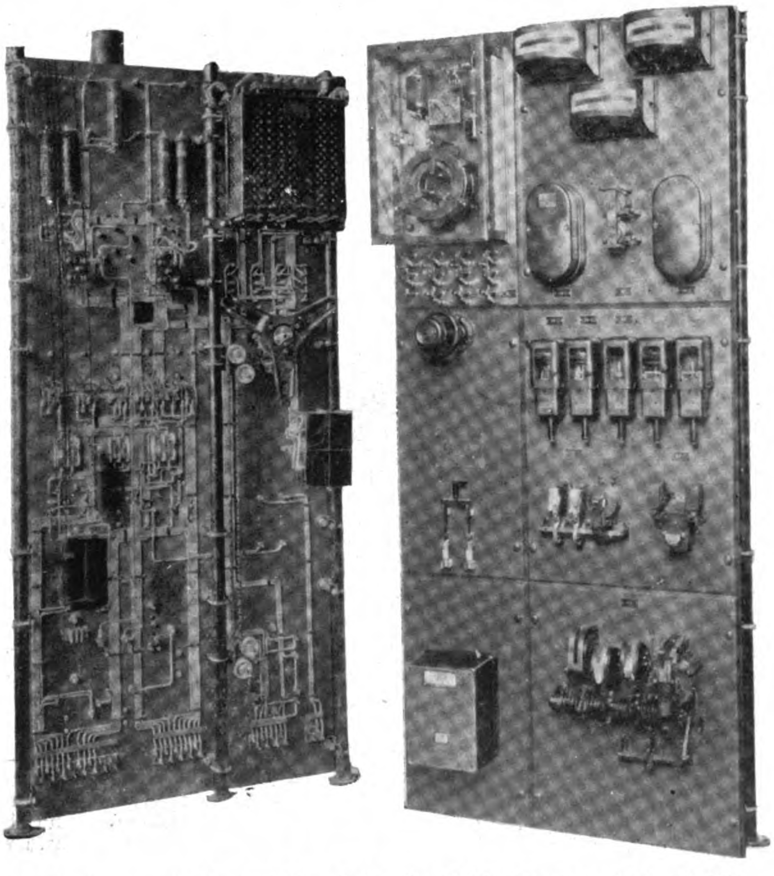


3,500 K.W.A. General Electric Generator designed to operate automatically

Japan's Purchases of American Electrical Equipment

Largest Automatic Hydro-Electric Plant in Japan

The Keihin Denryoku has recently ordered from the General Electric Company the electrical equipment for what will be the largest automatic hydro-electric power generating station in Japan. The station, to be constructed on the Oshiro River, will consist of a 3,500 K.V.A. generator driven by a J. M. Voith Company water wheel with full automatic control designed to perform automatically and in proper sequence all of the operations of starting, running, and shutting down ordinarily performed by the station attendant in a manually operated station. By simply energizing the transmission line from the controlling power station, the wheel is started, the generator is synchronized, and assumes its load.



G.E., Automatic Control Panels for the Oshiro Station of the Keihin Hydro-Electric Power Company

The equipment includes in addition to the usual protective device of a manually operated station, protection against sustained overloads, hot bearings, low voltage, underspeed, overspeed, and other irregularities usually cared for by the station attendant.

A similar equipment except of smaller capacity has been operating very successfully in a Toho Denryoku power station in Kyushu.

Westinghouse Equipment for Japan

"American manufacturers of electrical apparatus are now getting approximately 80 per cent. of Japan's increasing demand for these goods, whereas the major part of Japan's electrical orders went to Germany prior to the war. Japan has undertaken the electrification of 6,000 miles of state-owned railways, for which the government will spend about $50,000,000 a year, guarding against eventualities until this work is completed, of which sum about $3,000,000 a year will go for electrical equipment incident to the task. These and other details of the Japanese demand for American electrical goods, which at present shows no sign of diminishing, despite anti-American agitation arising from the immigration restrictions," were discussed recently by I. F. Baker, Japanese manager for the Westinghouse International Company, which has recieved an order from the Japanese government for $1,500,000 of railway electrification equipment through Takata & Co. This order is in connection with the huge electrification scheme for Japan's railways and covers the equipment for the extension of electrical service in the vicinity ot Tokio. It includes eight large locomotives for express service, which eventually will extend from Tokio to Kobe, about 360 miles ; ten 2,000 kilowatt 1,500-volt rotary converters, two 2,000-Kilowatt motor-generator sets, with automatic switching equipment, and a large amount of substation equipment.

"It is expected that future orders for electrification material will also be placed in the United States," Mr. Baker said, as the experience of the railways has shown them that the practice in this country is ahead of that in Europe. From tests they have made as the result of trial orders placed with American concerns, the railways also have realized the superiority of American-made goods. This has been due in some measure to the selatively large amount of electrification which has taken place in America in the last twenty years.

Several of the private railways in Japan have been electrified in the last four years and thereby the desirability of electrifying the Government lines has been proved. Electrification is very desirable in Japan, not only because of the dearth of coal, but because of the relatively narrow gauge of 3 feet 4 inches, which reriously limits the size of steam engines. Another advantage is that the smoke in the tunnels, which are numerous in mountainous Japan, will be eliminated.

Mr. Baker said that the electric business turned over to the United States by Japan in the last five years would average $10,000,000 a year, quadruple the average for the preceding five years. Before the war the Germans had a strong grip on this business, primarily because of the lower prices. It was soon found, however, he said, that electrical apparatus at the cheapest was not the most desirable.

Coal-Tar-Products such as destilled and prepared tar Pitch, Creosote Oil, Carbolineum, Naphtalin, Carbolic Acid, are offered for supply from own production (yearly production about 25,000 tons).

Asphaltfabrik Rudow,

Dr. Ing. Wilhelm Schliemann,

Aktiengesellschaft

Kanalstrasse, Berlin—Rudow

Engineering and Industrial Notes

BRIDGES

AMERICANS BUILD TOKYO BRIDGES.—Three American engineers will have charge of the construction of two large bridges which are to be erected across the Sumida river by the reconstruction bureau. The engineers are being selected now by the Foundation Company of New York. By applying American methods in the construction of the two bridges, the reconstruction bureau expects to avoid the long delays which occurred in the building of the Shino bridge across the Sumida several years ago.Fi ve years were required in which to complete this work. The Eitai and Kiyosu bridges, the two now to be constructed, are to rest on foundations sunk in the river bed by compressed air.

NEW BRIDGE FOR TIENTSIN.—The Haiho conservancy board has accepted the tender of the Etablissements Dade and Schneider, who are represented by Oliver & Co., in China, for the new international bridge at Tientsin. The bridge, which will form a continuation of the Rue de France, is to be of the Scherzer rolling lift type. The cost of the bridge is divided up into Gold $251,354 and French Francs 2,918,400, making a total of approximately Tls. 549,950. The caissons are expected to arrive in February 1925 and the bridge will be completed in February 1927. It will be supervised by the contractor's engineer and the conservancy commission will probably appoint an engineer to watch the construction of the bridge in their own interests. The bridge is to have two sets of piers on the bed of the river. The abutments will be 306-ft. apart, the facing of each resting on the normal line on either side. Neither of the two sets of piers must reduce the width of the river by more than twelve (12) feet on the site. The bridge will, therefore, consist of three spans. The mobile span will be such that when the bridge is open vessels will have a free fairway of 140-ft. and the structure will be so designed that there shall be no danger of its being fouled by passing steamers.

NEW HONGKONG BRIDGES.—Notification has appeared in the *Hongkong Government Gazette* calling for tenders in connection with the widening of eleven bridges in the new territories. This action was taken following a fatal motor bus smash when the jury, finding the men guilty of manslaughter, added a rider to their verdict, that they considered that all bridges in the new territories should be made the width of the roads they span.

NEW OVERBRIDGE FOR SSUPINGKAI.—The S.M.R. Co. is planning to build an overbridge over the railway tracks at Ssupingkai station to take the place of the level crossing. The new overbridge will be constructed in the next fiscal year at a cost of Y.400,000, and will be built on such a slight curve as to be practicable for loaded carts.

TSIN-PU RAILWAY BRIDGE.—The Tientsin-Pukow railway administration is reported to have imposed a tax of two copper cents on each passenger ticket, to raise funds for repairing the railway bridge across the Yellow River at Lokou. As the insurance on the bridge in question will expire next October, the department of communications will detail Mr. Chai Chao-lin to Tsinan to inspect the bridge structure and take steps for repair.

TUMEN RIVER BRIDGE.—The question of bridging the Tumen River has been pending between China and Japan for the past several years, but the Chinese feared that the bridge would enable the Tienpaoshan-Tumen railway to be connected with the Korean railway, as a military measure, refused to permit the work. Now that a section of the Tienpaoshan-Tumen line has been built, the Japanese consul-general at Chientao again has approached the *taoyin* of Yen-chi district for the solution of the question and the commissioner of foreign affairs at Mukden has agreed to the plan. The bridge will be built under the joint enterprise of China and Japan, the portion of expense to be shared by China being defrayed out of the royalty to be paid by the Tien-Tu railway. The commissioner of foreign affairs at Mukden has been appointed chief of the Chinese officials superintending the bridge construction.

COTTON MILLS

SPINNING MILL AT CHINCHOU.—The construction of the new Chinchou spinning mill of the Naigai Raw Cotton and Spinning Co., Ltd., has made good headway. The first installation of machinery arrived in April, on the completion of the mill buildings and the second installation was finished early in May. The new plant soon will be opened with 20,000 spindles in operation.

ELECTRICAL

HANKOW WATERWORKS WANTS TRANSFORMERS.—The Hankow Waterworks and Electric Light Co., Ltd., is calling for tenders for nine 1,000 k.v.a. transformers (2,300-6,000 volts), together with extra high-tension and low-tension switchgear and other gear necessary for the equipment of two transformer stations. Specifications and forms may be obtained from the head office of the company, Taiping Road, Hankow, at a cost of $10.00, silver. Sums paid for copies of specifications up to three will be refunded on receipt of a *bonâ-fide* tender. These tenders, submitted in duplicate and marked "Tender for transformers, etc.," must be declared at the company's head office by not later than noon of September 30.

MACHINERY

CRANES FOR JAPAN.—Export contracts have been placed in America for seven large cranes for shipment to Japan. An industrial works has received an order for four cranes of which two are for the railroads in Japan and two for the reconstruction bureau of the Japanese government. Another American manufacturer has just closed contracts for three large cranes for the Japanese reconstruction bureau.

DRYING MACHINERY IN JAVA.—Drying machinery for coffee is a subject which is commanding great attention at present among estate owners and machinery importers in Java, according to Vice-Consul Rollin R. Winslow, of Soeraboya, Java. The first types used were similar to the American hot-air furnace, but this system, however, has recently been supplanted by a central water heating system of a patented Dutch design that furnishes hot water to a series of radiators in the outlying drying houses. There is much room for improvement in the method of drying coffee and rubber, and any new system which would lessen the time required for drying would probably meet with success in East Java. Until a new system is introduced, it is believed locally that the hot-water system of central heating with radiators, etc., will be the most popular one in Java markets. Many of the estates which had the hot-air systems have supplanted them with central heating plants.

MINES

ANSHAN & PENCHIHU STEEL WORKS.—Mr. K. Takemura, councillor of the S.M.R. Co., reports that the new expansion program of the Anzan Iron & Steel Works has been well started and that the Penchihu iron and steel works is now turning out about 40,000 tons of pig iron a year by use of one of the blast furnaces.

The rich ore of Penchihu will be exhausted in seven or eight years hence. But, an immense quantity of low-grade ore is obtainable, which, by a new method of concentration, should vastly prolong the life of the mines.

CHINESE MINING ENCOURAGED.—The Chinese ministry of agriculture has addressed the following instructions to the provinces for the development of mining products: Where government mines have already been opened, work should be expedited and detailed reports should be submitted to the ministry: A complete list of gain and loss and the daily volume of production of all the government mines in the provinces should be submitted to the ministry; where government mines have not been operated, work should be started at once. If the provincial government is financially unable to carry on the work, it may start a joint enterprise in conjunction with the local merchants; where work is suspended in the case of government mines, a report to that effect should be submitted to the ministry; profits made on government mines should be carefully deposited; the government mining bureaux must consult with the ministry from time to time and directors of government mines should constantly confer with the experts and engineers for better means of production and sale.

COAL RESERVES OF FUSHUN MINES.—Estimates vary widely as to the total coal reserve held by the Fushun Collieries regarded as the richest coalfield in the Orient. Some geologists put the total at 1,000,000,000 tons, which may be assigned to the different shafts and pits as follow:

	Tons
Oyama shaft	130,000,000
Chienchinchai pit	135,000,000
Yangpaipu pit	38,000,000
Togo shaft	70,000,000
Laohutai pit	153,000,000
Wanta pit	163,000,000
Hsintun pit	150,000,000
Lungfeng pit	160,000,000

So far the outputs from the different pits are as follow:

	Tons
Oyama shaft	4,000,000
Chienchinchai pit	9,000,000
Yangpaipu pit	6,000,000
Togo shaft	4,000,000
Laohutai pit	5,000,000
Wanta pit	1,000,000
Hsintun pit...	400,000
Lungfeng pit	900,000
Total	30,300,000

There still remains something like 970,000,000 tons available for mining. Of course, the consideration of mining costs and other factors might prevent part of the vast coal reserve from being mined but even with an eventual output of 7,500,000 tons, according to the present program, coal will be available for 130 years hence.

COAL TRADE OF HONGKONG.—Coal imports—about 82 per cent. of which were bituminous—into Hongkong for the year 1923 amounted to 1,403,491 tons, as compared with 1,048,175 tons in 1922 and 1,175,871 tons in 1921. About 33 per cent. of the bituminous coal comes from Japan, 31 per cent. from Formosa and adjacent islands, and the remainder from North China, Manchuria, South Africa, and Borneo. All of the anthracite coal comes from Indo-China with the exception of about 10 per cent. which is supplied by Great Britain for the use of the British navy. About 25 per cent. of the local coal imports are re-exported to nearby ports for use by small river steamers and launches and by manufacturing plants.

COPPER-MINING IN INDO-CHINA.—Copper-mining concessions for the exploitation of the deposits at Luang-Prabang, Laos, have been granted to the Société des Mines de Cuivre du Haut-Mekong, in order to determine whether the deposits are important enough to mine on a large scale. The société has a capital of 500,000 francs and its head office is at 126 Rue de Provence, Paris.

FORMOSAN COAL OUTPUT.—The output of coal in Formosa during 1923 was approximately 1,380,000 tons, an increase of 130,000 tons and 390,000 tons respectively as compared with 1922 and 1921. Of this amount 420,000 tons was for home consumption, whilst 270,000 tons was absorbed for bunkering purposes. The exports amounted to 665,000 tons, of which 180,000 tons went to Japan. The exports to Japan show a slight falling off, probably due to the effects of the earthquake, but this decline is more than made up for by the increased exports to foreign countries. Consumption in the island is not expected to show any material change during the current year except that the Takao çement factory will soon be working at full pressure, and will require largely increased supplies. With the completion of the Gyuchoko special coal wharves at Keelung, the greatly enhanced facilities that will be available for bunkering are expected to bring a substantial addition to the number of ships calling for that purpose.

FUSHUN COAL FOR MANILA.—The total annual coal consumption at Manila is about 500,000 tons, according to Mr. I. Ogawa of the S. M. Railway sales office. Up to two years ago, only 40,000-50,000 tons of Fushun coal used to be sent in that direction. The Filipinos take very kindly to Fushun coal, especially lump coal, so easy to catch fire and also to handle. The demand has increased rapidly until some 35 per cent. of the whole consumption now is Fushun coal, with promise of further increase. Of the import coals, Japanese coals take the first place in Manila, followed by outputs from Fushun, Australia, India, etc.

KENJIHO WORKS OF CHOSEN.—The Kenjiho Iron & Steel Works, Chosen, under the management of the Mitsubishi Company, is producing some 10,000 tons of pig iron from two blast furnaces. Owing to shortage of ore, new supplies must be bought. This handicap casts a doubt as to its future despite its favorable situation. It commands ample railway and steamer facilities and the works are splendidly equipped, so that even importing of ore may not impair its ability to operate at a profit. The works owns a steel manufacturing installation capable of producing thick plate and angle of about 50,000 tons a year, but this installation is now left idle, pending the return of Mr. Matsuda, its superintendent, who is now abroad, studying steel manufacture.

NATIONALIZATION OF JAPANESE COAL PROPOSED.—As a means of solving the fuel question of Japan, the nationalization of coal has been proposed. The coal production estimates in Japan for this fiscal year are about 28,000,000 tons, inclusive of Formosa, Chosen, and the Loochoos. Besides, the import of 1,300,000 tons of Fushun coal, not to mention a large quantity of foreign coals, must be reckoned with. The importation of coal from abroad in such increasing quantity has formed a menace to Japanese coal mine-owners, who find it extremely difficult to carry on under the existing circumstances.

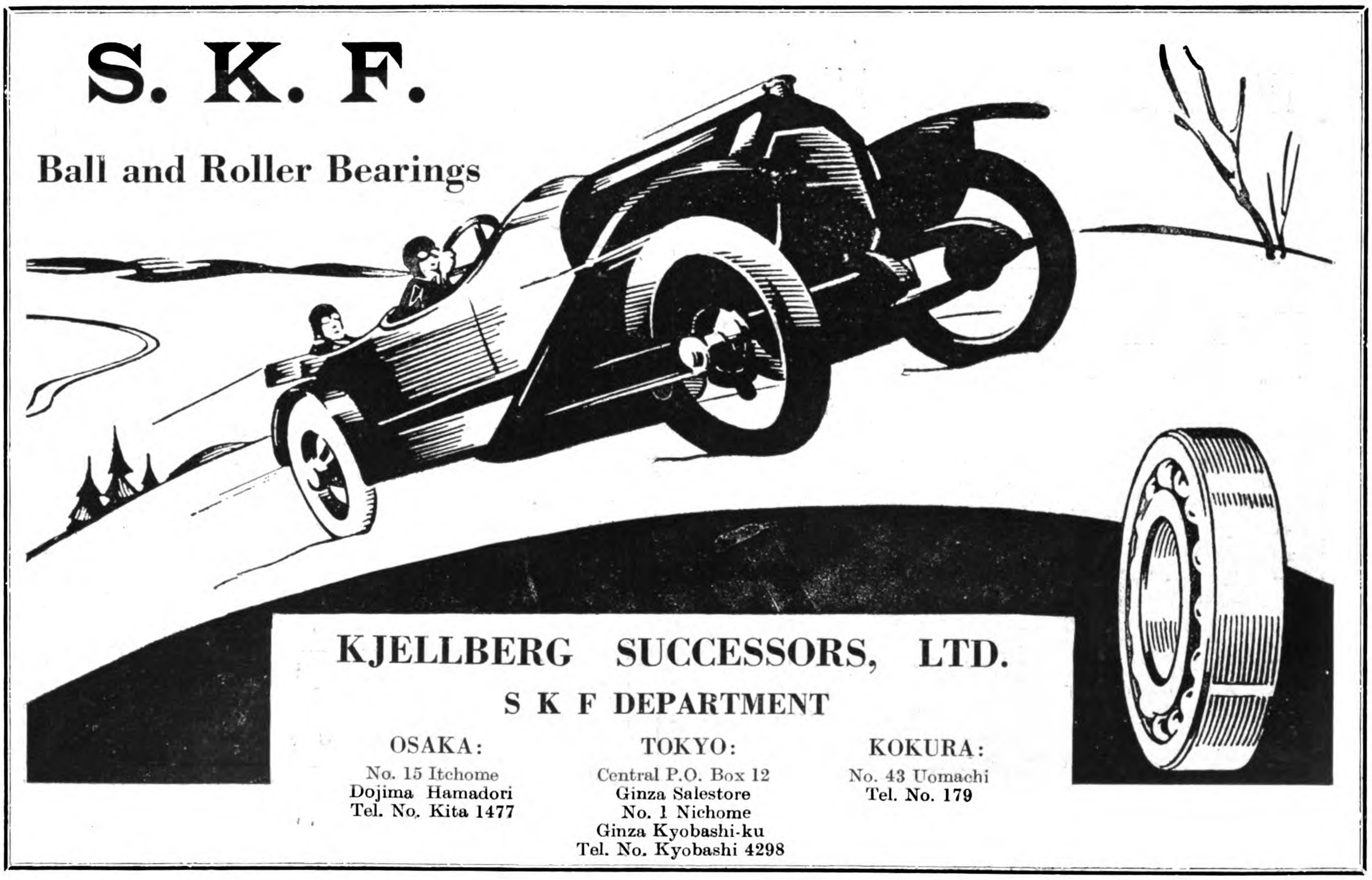
From a permanent national point of view, the nationalization of coal is suggested as most timely. At the present pace, the coal reserves in Japan are threatened with exhaustion in 50 or 60 years. By nationalizing coal, the coal outputs in Japan may be reduced, and the whole of the deficit may be supplied with Fushun coal by increasing the annual production from 5,500,000 tons to, say, 9,000,000 tons or even 10,000,000 tons.

LUAN-YEN IRON FIELD.—Reorganization of the company holding the valuable iron mines at Lungkuan and Yentungshan, along the Peking-Shuiyuan railway, is a near possibility as the shareholders of the corporation have elected Admiral Wu Yu-lin, minister of communications, managing-director. These mines were originally discovered by Mr. Anderson, a Swedish mining engineer and adviser to the ministry of agriculture and commerce, and the mining corporation was organized by several Anfu leaders, with the support of Marshal Tuan Chi-jui, ex-premier. The company started work with a capital of $5,000,000. During the world war, large quantities of iron ore were sold to western purchasers and Japan, and subsequently a loan of two million dollars was contracted from the Sino-Japanese Exchange Bank for the erection of modern furnaces at Yentungshan. The political defeat of the Anfu party caused great confusion in the administration of the corporation, and at the present time, the company is practically moribund although the iron ores it controls are reported to be equal in quality to the Tayeh iron ores of the Han Yeh Ping Corporation, and the Japanese iron mines at Fushun. The Anfu leaders have now transferred their rights to the Chihli leaders and it is reported that Japanese and other foreign capitalists are willing to raise funds for the successful development of the mines provided the management of the Chinese corporation be thoroughly reorganized on modern business lines. Admiral Wu Yu-lin, on account of the pressure of his duties, has appointed Mr. Sheng Chi, technical expert of the chiaotungpu, as the resident director of the Lung-Yen mines.

PETROLEUM

OIL PROSPECTS IN LEYTE, P. I.—Leyte offers greater prospects for oil than the Bondoc peninsula, according to Victoriano Elicaco, chief of the division of mines and assistant director, bureau of science. Elicano returned recently from geological explorations in Leyte, Albay and Cebu. The Richmond Petroleum company has been unsuccessful so far in its attempts to strike commercial deposits of oil in the Bondoc peninsula. The presence of two favorable structures wherein oil might be accumulated was confirmed by Elicano. These structures, on the Balinsilang Oil company's lease in Leyte, although not perfect, mark the zone where drilling might be started. Presence of the structures, however, do not imply necessarily the existence of oil.

Elicano also inspected coal conditions, visiting the Liguan coal mine at Liguan and the Calanaga Coal Mining company at Caracaran. Both mines are in the development stage and



production is small but the mines show the varied possibilities of the Philippines in natural resources. Folding and faulting make systematic development of the mines difficult and expensive but the geological phenomena helps to make the quality of the coal better than that found in other parts of the islands. He urge caution in development of the mines. Liguan coal is used by Legaspi and Tabaco steamers while Calanaga coal is used by the Manila Railroad company. Elicano also visited the Cebu Portland Cement company's plant and said that test by the bureau of the Cebu cement demonstrate a quality that can be compared favorably, if it is not superior, to imported cement.

RIVERS AND HARBORS

DREDGING SOOCHOW CREEK.—According to two letters received by the Shanghai general chamber of commerce from the Chinese general chamber of commerce, the funds necessary for the conservancy of the lower part of the Soochow creek have been successfully raised through the co-operative efforts of the public organizations of the eight districts concerned and the commercial bodies of Shanghai. It is promised that the work of relieving the congestion will begin immediately.

MIN RIVER DREDGER CONTRACT.—Tfe Min river conservancy board at Foochow, China, has awarded a contract for the suction dredger to a Shanghai firm as agents for a manufacturer in Scotland. In all 20 tenders were submitted, among which were four bids from American firms.

S.M.R. CO. AND THE LIAO RIVER.—The S.M.R. Co. has invested over Y.2,000,000 in conservancy work on the Liao during these 15 years. For the current year, the company has set aside Y.50,000, which is expected to be the last disbursement to be made by the company on this work, for the present.

RAILWAYS

CELEBRATE 10,000th MILE.—At the call of the Japan railway association a celebration of the completion of 10,000 miles of government and private railways will be held on an elaborate scale with Osaka as its centre on October 3, 4 and 5. Among concerns, participating in the celebration are the N.Y.K., O.S.K., T.K.K., Kyoto, Osaka, and Kobe municipal tramways, six Osaka suburban tramway companies, and the Train-making Co., Fujinagata Dockyard, Kawasaki Dockyard, factories in Niigata and the Sumitomo Steel Works. All these are closely connected with the railways and transportation. As expenditure for the celebration Y.200,000 is to be provided, the railway association contributing Y.50,000, and the participators Y.150,000.

DOUBLE GAUGE GOODS WAGONS.—The South Manchuria Railway Company has successfully carried out an experiment with goods wagons adjustable to tracks of different gauges. They are especially designed for use in the proposed through traffic service of the Chinese Eastern Railway and the South Manchuria Railway. Through traffic will be greatly facilitated by the use of these cars avoiding the inconvenience of unloading and reloading at Changchun. The Chinese Eastern Railway has a gauge of 5-ft. and the South Manchuria Railway's gauge is 4-ft., 8½-in.

HEILUNGKIANG RAILWAY AGREEMENT—The Heilungkiang government is reported to have drawn up an agreement with a Russian capitalist for the construction of the Hu-ai railway. According to Chinese newspapers, the following are the contents of the draft agreement:—With the approval of the officers, citizens, merchants and people of Heilungkiang as a whole, the Russian merchant, Hsieh Chieh-ssu (Chinese name of the Russian capitalist) shall advance the construction of the Hu-Ai railway which shall start from the Sungari town of Hulun on the north bank of the Sungari River and end at Aikiang *hsien* via Hulun, Suihua, Hailun and Wangkuei. The line is 840 *li* long.

Hsieh Chieh-ssu shall be responsible for building the whole line, purchasing lands along the line and building stations, offices for selling tickets, and godowns and for all other expenses. Beginning from the date of the assumption of train services, Hsieh Chieh-ssu shall be permitted to be the manager of the line for eighteen years after which the line shall be unconditionally returned to China. The annually profits of the line shall be divided between China and Hsieh Chieh-ssu at the rate of 30 per cent. and 70 per cent. respectively.

China shall appoint the assistant director, and station masters of all the stations and have the right to audit the accounts of the line. The right of protecting the line shall belong to the Chinese troops along the railroad to be freely detailed and recalled by China. The line shall supply them with expenses and ammunition. Within two months of the signing of this agreement, construction work shall begin, otherwise the agreement shall lapse.

LEVELLING S.M. RAILWAY.—The work of lowering the level of railway track about Liaoyang has now been under way two months, contracts for the work having been awarded to several Japanese firms. In view of the approach of the rainy season, the work will be pushed forward with utmost dispatch. The entire work, including materials, is estimated to cost about Y.300,000. The work includes a bridge over the Lingkungting, a new concrete culvert, with embankments and retaining works.

NEW DAIREN STATION BUILDINGS—The new Dairen station buildings are to have 2,000 *tsubo* in total floor space, and are to be built at the west of Nippon bridge. The construction work will extend over three years, and will cost about Y.2,500,000. For the current fiscal year, Y.100,000 is set aside for the foundation work, most of which is to be finished within this year. The Nippon bridge, which is only 15.5 metres wide, is to be broadened by 10.5 metres on the western side. The tramway will be double-tracked.

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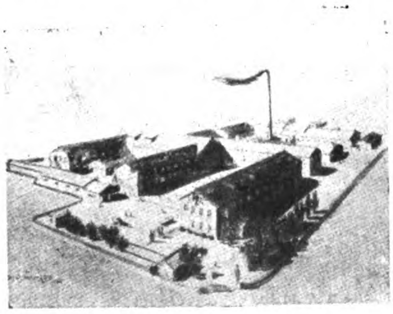

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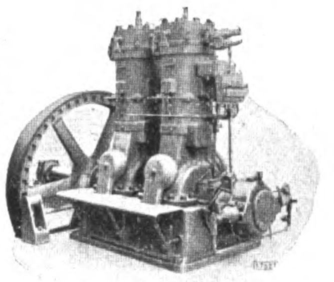

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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

上海仁記路第五號

遠東時報

WHY NATIONS FIGHT

A BIG AMERICAN BELITTLED

MORE OIL.—THAT SECRET RUSSO-JAPANESE TREATY

JAPAN-CHINA COTTON MILLS AT SHANGHAI

VENEER INDUSTRY OF JAPAN

BRITISH EMPIRE EXHIBITION

SINGAPORE WATER SUPPLY

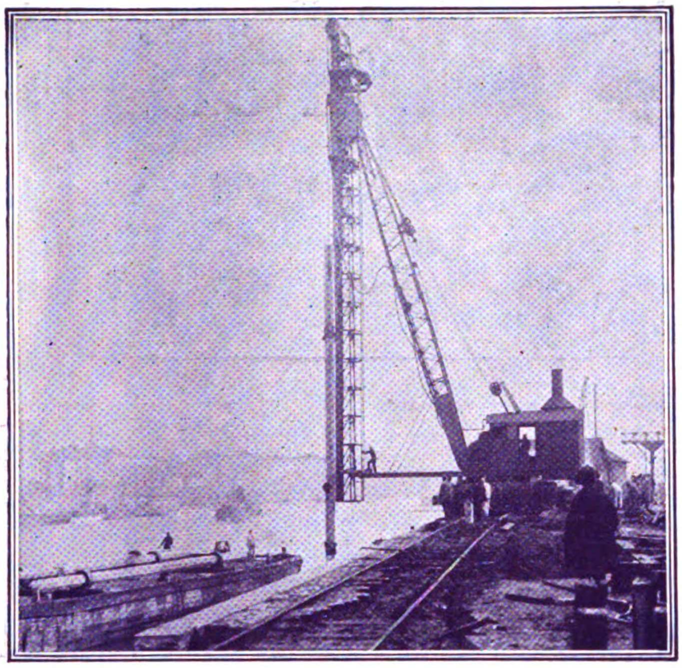
JAPAN'S HIGH VOLTAGE TRANSMISSION SYSTEM

TIN MINING IN F.M.S.

Vol. XX August, 1924 No. 8

A. L. TAYLER

SHANGHAI, PEKING, TOKYO AND MANILA



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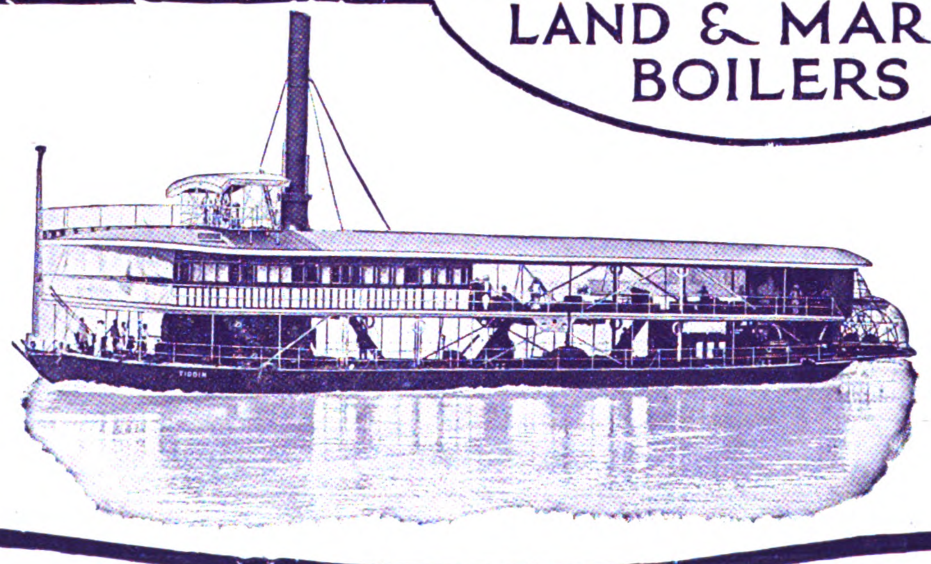


The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, AUGUST, 1924 No. 8

Why Nations Fight

The Ringed Fence Around Japan

THERE was a time ten or more years ago when the utterances of Japanese jingoes fully justified the United States in preparing for trouble. Conditions have changed since then and it is now the highly placed strategists in the United States who give vent to bellicose thoughts. Last year about this time two ranking officers of the American navy attending the annual conference of the institute of politics at Williamstown, urged a huge appropriation for the navy on the hypothesis that some foreign power might discriminate against our rights to equal opportunity in the trade of China, and it came out in the debate that the hypothetical enemy was Japan. A month ago, or immediately after the president signed the immigration law, Rear-Admiral Bradley A. Fiske, another of our foremost and most capable strategists, threw another jolt into the American people by pointing to the peril of a war with Japan because diplomatic relations had become strained between the two countries, by the recall of Ambassador Hanihara. "Such attitudes and such acts have usually preceded wars, although they have not always been followed by wars," said the admiral, and then went on to explain why, under these conditions, the navy should be strengthened. There were many excellent reasons why the navy should be brought up to its full strength under the 5-5-3 ratio without lugging in Japen, the weakest of the three great naval powers under the disarmament treaty, but in our country every time an increased army and navy appropriation is deemed essential by our strategists, some specific enemy must be used in order to get the required public approval. Unfortunately, the hypothetical enemy is always Japan. Now comes Major General James G. Harbord, one of our greatest living military leaders and in order to put over his plea for military preparedness, picks Japan as the possible enemy. General Harbord, however, is more conservative than his naval colleagues and presents his facts in a more convincing manner. He takes the stand that only in America can the Asiatic find an outlet for his surplus millions and such being the case, believes a rich and powerful nation must always be alert to protect itself from impoverished and embittered peoples. He goes on to say :

"The most striking fact of the world to-day is the very uneven division of the earth among the sixty odd nations that occupy the entire land area of the globe. At one extreme, we have the 60,000,000 Japanese occupying the islands of Japan with a total arable land smaller than the area of Ireland and at the other extreme, 65,000,000 white people in the whole British empire, occupying 7,000,000 square miles and ruling another 7,000,000 square miles.

"Or again, including Korea and Formosa, the entire area under the Japanese empire is 260,000 square miles and the population over 77,000,000, while just across the Pacific, the United States and Canada, with more than seven and one-third million square miles, have a population of 115,000,000.

"Thus there are nearly two-thirds as many people in the limited area of the Japanese empire as there are in the vast territory of the United States and Canada. Does it not seem inevitable that the peoples in North America must be prepared some day either to share their enormous possessions with the peoples of Asia or to defend them against forcible aggression ?

"It is well to recognize the truth that the greatest conflicts may be between nations both of which are right. Certainly, nothing but incalculable harm could come to the United States if the Japanese and the Chinese could enter the United States according to their needs. And it is just as true that the Japanese and Chinese are most unjustly deprived of their rights to a more equal share of the earth's surface.

"Both sides are right. Force will determine which right shall prevail."

In other words, might is right. Looking at the problem from General Harbord's viewpoint his conclusions are eminently fair. In fact, it is the first time a high American authority has even suggested that Japan might have some right on her side. We do not, however, believe in the inevitability that the peoples of North America must prepare to defend their homelands against Asiatic aggression. Ten years ago, we supported the ideas expressed by General Harbord as a purely preparedness argument but now believe that the real solution of the racial problem lies in Asia, and if American policies were adjusted to bring this about, an end would come to all this talk about a possible war with Japan.

If Russia is permitted to absorb all the available population outlets in Asia and exclude the Mongolian race from the lands stolen from them, the resultant pressure will force the Mongolian surplus across the seas. The real menace, therefore, to the security of the United States is not Japan but the growth of Russia to a point where she will dominate Eastern Asia and again close her doors to Chinese and Japanese capital and labor. This will certainly lead to a show-down between Japan and Russia or force the racial issue out into the Pacific for Americans to settle. If Americans would only see through this nice little scheme to make them fight Japan and wake up in time by remodeling their Far Eastern policies, the program might be changed. If, instead of hampering and hamstringing Japan every time she has the diplomatic advantage in the struggle that will open to her people the lands of Eastern Asia, America would encourage her in this direction, there will no need to spend annually millions for preparation against a possible aggression on the part of Japan. A policy which deliberately invites and prepares for a war in the Pacific when the issue should be fought in Asia, is to say the least, assinine.

Russia Absorbing China's Possessions

Let us look at the picture painted by *The Central China Post.* In commenting on the large postal map of China eight feet by six in dimensions affixed to the blank wall in the editorial sanctum it says that while one-third of the map (representing 1,500,000 square miles) is packed so closely with place names that it would be hard to find room for another, the remaining two-thirds of the area of the map (representing 2,850,000 square miles) are staringly empty. The one-third is China proper and the two-thirds is China's possessions in which China can hardly be said to be in possession. Mr. Archibald then goes on to point out that Mongolia with 1,370,000 square miles (nearly as large as China proper) is a Soviet republic in which the real power is all held in Bolshevist hands. Red troops are still in the country and although China has protested again and again there is no sign of any change being made in the situation.

Then, he adds, there is Sinkiang, or Chinese Turkestan, in which Chinese officials are functioning but Russian settlers are pouring in in large numbers. "What is to be done with this Russian invasion is still unclear," but he believes it will end in another declaration of independence and the formation of another Soviet republic under the protection of Russia. "Soviet Russia," he declares, "is quite as aggressive as ever Imperialist Russi awas. It is equally keen on expansion, although the methods by which it contrives to reach its end are different." Lastly, he invites attention to the situation in Tibet in which Great Britain is mixed up. It was the coquetting of Russia with Tibet that led to the Younghusband expedition to Lhassa in 1904 and the signing of treaties which eliminated China's

shadowy hold over that country. To-day, China has nothing to say in the administration of Tibet." Since Mr. Archibald wrote the above, the Chinese provincial government of Sinkiang has entered into an independent trade treaty with the Soviet. The announcement that the treaty was sanctioned by Peking, is merely a face-saving statement to conceal the impotence of the recognized Chinese government.

Where will Italy Expand

Let us now turn to another picture. *The Christian Science Monitor* of June 30 asks " where will Italy expand ? It then goes on to depict a very pathetic picture of the dilemma with which the Italian nation is faced through the pressure of population. Emigration to America has in the past relieved this pressure but with this outlet stopped by the recent immigration laws, where will the Italian worker turn ? *The Monitor* points out that as in Germany before the world war, the Italian government seeks to find an outlet for the excess population that will not lose for the mother-country the political allegiance of the departing children. About the only place where this can be done is in northern Africa where great areas that supported a large population at the beginning of the Christian era have been allowed to deteriorate by the nomadic Arabs. But here they will come in conflict with the imperialism of France who has not the colonists to develop her African possessions. The Italians have. So, *The Monitor* believes, that " the European equilibrium will be benefitted by an Italian mass emigration to the southward. More history will be made there in our own times."

Here is a great imperialistic republic reaching out and constantly adding to its African empire, when it has no colonists to develop its resources. Every Frenchman who goes to the colonies leaves a void in the economic life of the homeland which in the past has been filled by the Germans, the Italians, the Poles or other Europeans. We see here a problem almost identical with the one confronting Japan, with the difference that aside from the quota bar in America the waste spaces of the world are open to the Italian. France controls a colonial empire in Africa, which, if developed at all, will probably be done with Italian labor, a possibility that is now brought within the realms of reality by the operation of the American law which closes the door to an annual overflow of 300,000. If the trend of emigration throws these Italians into Northern Africa and the mother country insists on holding their political allegiance, what will be the outcome ? We hear no condemnation of Italy because she seeks an outlet which means in its last analysis the acquisition of territory by peaceful penetration or open conquest at the expense of some other nation.

Forcing Japan to Fight

Keeping these pictures in mind let us return to the argument of General Harbord and ask : why should Japan seek an outlet for her surplus millions four thousand miles across the Pacific when there is ample room for them nearer at home in the waste places of Eastern Asia ? Why should it be inevitable that the peoples of North America must be prepared some day either to share their possessions with the peoples of Asia or to defend them against forcible aggression, when there are nearly 3,000,000 square miles of waste territory open for settlement within the confines of China and probably an equal area in Siberia? Why then should it not be inevitable that China and Japan should overflow into the vacant lands within their own habitat where there are as many opportunities for profitable development as in America ? Why should Americans always see in Japan's pacific efforts to obtain an outlet for her people a menace to their own security, when they deliberately close their eyes to the land-grabbing program of Russia which slowly but surely is absorbing the outlying possessions of China and the vacant spaces of Central Asia, building a wall around the Yellow Man and forcing him over the seas to seek his future ?

Why should not the policy of the United States undergo a radical change and, instead of picking on Japan, be directed towards checking Russia's expansion in order that China and Japan can find a peaceful solution to the racial problem by opening to them an outlet within the lands that God, nature and geography intended should be theirs ? Why should not the American government formulate a new outlook on Asiatic affairs in which the cardinal principle would be to encourage Japanese development of Eastern Asia, so that the racial question, if it ever has to be faced, will not be shouldered on to its own people ? There is absolutely no reason for America to prepare against the possibility of Japanese aggression in order that they may enter our country. There is every reason on the other hand why we should arm and be always prepared to fight if our present policy is perpetuated. If we close our doors against the Japanese ; teach other peoples how it can be done ; then follow them up in Asia and bar them out of the Philippines, standing between them and expansion to the south ; if we build a ringed fence around them in Manchuria and constitute ourselves the protector of China, the savior of Russia and the police of Central Asia and concentrate our diplomacy on handicapping their legitimate aspirations in Mongolia, Siberia and Saghalien ; we must prepare to fight Japan some day. Even a yellow cur will fight when driven into a corner. And Japan is not a yellow cur.

Stake by stake the ringed fence around Japan has been erected. It only remains to string the barbed wire entanglements. There was just one outlet, which looked out upon the vast plains of Manchuria and Mongolia. The cloud no bigger than a man's hand, however, has now appeared on this horizon. News dispatches from Mukden report that Marshal Chang Tso-lin, overlord of Manchuria, has issued an order prohibiting aliens from leasing land within his jurisdiction for agricultural purposes. It would look as though he had taken a leaf from the book of California or employed an American from that state as his adviser. If that order is carried out ; if the one outlet for Japan's millions is closed, if Japan is to be the one nation in the world to be fenced in, penalized and denied the right to emigrate, we heartily concur with our strategists that we must keep our military and naval establishments up the highest point of perfection and preparedness. No government in Japan, no matter how pacific, how liberal or how friendly, would be able to withstand this challenge to the right of its people to exist.

* * *

American Money for Japanese Development

The Success of the Daido Loan

THE success attending the flotation of the first installment of the Daido Electric Company's loan in New York is convincing evidence of the friendly feeling of the American people towards Japan. Within a few hours, the issue of $15,000,000 was oversubscribed, twice the sum required being offered, and the outstanding feature was the applications for $3,000,000 by California investors. The total amount of the loan is $30,000,000 secured by a first mortgage on the extensive properties of the Daido Electric Power Company and which will be the basis for electrical equipment orders to that amount.

Momosuke Fukuzawa, head of the Daido electric power interests, has been in personal charge of the negotiations assisted by Messrs. Thebo and Anderton of the San Francisco engineering firm of Thebo, Starr & Anderton.

The decision to seek a loan in the United States followed two or more years of thorough study of Japanese hydro-electric development possibilities. As a result of this the Daido company has already built five large power stations on one river and plans to electrify another to supply more adequately the cities of Tokio, Kobe, Osaka and other population centres. The possibilities in this connection are of great economic importance to Japanese industrial and domestic consumers.

The fact that Japan is one of America's most rapidly growing customers for electrical equipment and apparatus and is now buying from American concerns at the rate of $10,000,000 or more a year has been a strong factor in the successful flotation of the loan. The fact that such large American concerns as the General Electric and Westinghouse companies will supply a large part of the central station, generating and other equipment covered by the proposed loan, is another consideration which made the issue popular.

The Japanese government has taken no part in the negotiations ; it being a purely private undertaking on the part of the bankers who had a representative in Japan for the purpose of studying the proposed hydro-electric developments and whose report was favorable.

Only half of the full amount of the mortgage credit has been made immediately available, the rest of the loan to be extended, as the orders for the needed electrical equipment require. The

flotation of 50 per cent. of the loan at this time has behind it the fact, also, that the American money market, with its prevailing low rates, is extremely favorable to financing through the sale of bonds. Messrs. Dilton, Read & Co. will have charge of the flotation.

Because it has been the policy of the Fukuzawa interests to divide their electrical orders among the large American companies, another company which is expected to share in the future orders for the projects planned is William Cramp & Sons, ship and engine builders. This company supplies, besides nautical equipment, water wheels for industrial and hydroelectric plants.

The Hakata Harbor Contract

The next important Japanese proposition to be placed before American financiers will be the scheme for constructing a new harbor at Hakata in the island of Kyushu, where the Asia Development Company (an American enterprise whose head office is in Shanghai) has signed an agreement to build a harbor, docks, breakwater and a two-mile tunnel to connect with the town of Fukuoka on the main railway line between Moji and Nagasaki. The entire contract will approximate Y.11,000,000. The tunnel is intended to tap the many coal fields in the vicinity, the richest in Japan, having a combined output of 2,000,000 tons of coal annually. It is expected that with the completion of the harbor and the tunnel Hakata will become one of the most active ports of Japan taking away much of the coal traffic which now passes through Moji and Nagasaki. The harbor construction plans have been drawn by Dr. Kawakami an authority on harbor works and on the completion of the contract the harbor will accommodate thirteen steamers of 10,000 tons each at one time. The Hakata people are also contemplating raising the further sum of Y.80,000,000 in the future for the reclamation of a harbor area three times as large as the present size of the city and erect a large iron foundry and other industrial plants.

* * *

Mints and Arsenals

Governor Yen of Shansi on the War Path

(Contributed)

VARIOUS items of news from foreign and Chinese sources which have recently come to hand in Peking have appeared to indicate the possibility of a change of policy in the so-called model province of Shansi, a result which would be the more regrettable in that up-to-date Governor Yen has successfully endeavored to keep his jurisdiction aloof from those military plots and civil wars which are devastating the rest of China. The first indications of a change in his attitude were evinced last year over the vexed question of suppression of opium, for Governor Yen took the most stringent steps to prevent the drug passing through his territories in any direction, an act which undoubtedly alienated many of the militarists who base their present fortunes upon a systematic and judicious cultivation of the poppy in the areas under their control. It is quite possible that Governor Yen himself foresaw what the result of his actions would be, for the powder plant supplied some time ago to his arsenal can hardly be explained on any other basis, while his most recent action in calling for material suitable for the manufacture of light field artillery and bomb throwers would be but an extension of his new policy of "forewarned is forearmed." A foreign observer recently returned from the province reported to the effect that experiments in mining had also been carried out a short time ago, the Chinese stating that field mines had been laid along the approaches from the Peking Hankow Railway at Shihchiachwang towards Taiyuanfu. Taken in conjunction with certain enquiries as to the construction of machine gun "pillboxes" and their suitable sitting on hillcrests so as to command mountain passes there seemed to be sufficient material to warrant further investigation, for a decided change in the attitude of the province of Shansi towards the Chihli party would be of the utmost importance under the present uncertain political circumstances.

At first glance everything in the model province seemed quiet and peaceful. The little narrow gauge railway which connects Taiyuanfu with the main line appeared to be running in perfect order, the inspectors who enquire as to one's identity and keep a keen eye for opium smugglers were on the job as usual, and although many soldiers were to be seen at the railway stations *en route* they did not venture to invade the first-class carriages as is their custom on the remainder of the Chinese railway system. The rolling stock was in pretty fair order, the stations too were clean and plastered over with placards threatening dire punishment to any who were caught smuggling opium, pronouncements which the past twelvemonth has shown to be no idle boast, for opium smuggling has indeed been put down with a strong hand throughout the province. When one reaches Taiyuanfu itself the city seems to be wending its usual quiet and prosperous way, and it is not for some hours that it becomes apparent to the observer that there are indeed more soldiers than formerly passing to and fro in the busy streets, and that the people themselves have an air of strain and suppressed excitement as if important events were in the shaping. A rough estimate would place the troops in the capital alone at some ten thousand rifles, a large proportion of the provincial army if it is still maintained at its old standard of eighteen or twenty thousand for the whole province. That these numbers have been considerably increased seems no more than probable however, for further investigation shows that the arsenal is working full time turning out munitions of war, while several representatives of foreign firms are to be noticed in the city, doubtless tendering for the supply of machinery to the provincial mint. For this is the name under which munitions of war masquerade in China to-day, and Taiyuanfu is no exception to the rule. After all, if Governor Liu Chen-hua of Shensi can call for tenders on the specifications of a mint that turns out cartridges and rifles as well as dollars why should not Governor Yen Hsi-shan employ a similar device if only in self-defence. British and American firms will naturally insist on supplying material solely for minting purposes, having regard to the arms embargo but manufacturers and importers of other European nations are hardly likely to be so particular, wherefore there can be little doubt that the governors of Shensi and Shansi alike will obtain any and every kind of plant for "minting" which they may happen to desire.

As far as can be ascertained the output of the arsenal (we mean of course mint) is limited to ammunition and rifles, though some say that machine-gun parts are also manufactured, but at any rate there is no doubt that output of some kind is being pushed forward as rapidly as possible. The head of the gunpowder department of the "mint" is a doctor of chemistry graduated from Switzerland, while the other departments for the manufacture of lethal "finance" are under a German engineer. The latter chanced to be out of town at the moment, and it is commonly reported that he has resigned and will be leaving shortly on account of a difference of opinion as to the possibilities of the plant in manufacturing artillery. The Chinese are relating a story anent this which seems almost too crazy to be true if one does not know China and realize that anything may happen here under present conditions. It seems that governor Yen desired to purchase some light artillery and bomb throwers, and having discovered the impossibility of obtaining them from abroad decided to manufacture them at Taiyuanfu in his own arsenal. That the plant is not suitably equipped for such work made little difference, the fiat had gone forth, and the materials were to be tendered for. One would naturally imagine that chrome-nickel steel would be specified and supplied, but in thus estimating one would be failing to allow for the vagaries of the Chinese mind. Of course the story as related in Taiyuanfu may be a myth, but it is asseverated there that one firm tendered for supply of wrought iron for the bomb throwers (we mean of course "minting" machinery, how one's typewriter is apt to run away with one) and that their proposal was more than favorably considered. Ordinarily, one would classify this story as the result of too many whisky sodas, but in this case where there is smoke there is fire, and the fact remains that half a dozen representatives of various firms were perambulating around the city, discussing business with certain officials and in general behaving as if they were not in Taiyuanfu for their health alone. To this story is linked up the resignation of the engineer to the arsenal—mint, the only statement which is susceptible of immediate proof, but here again, of course, one cannot definitely state that his retirement may not have been due to entirely different reasons or difficulties and disputes arising prior to this last ebullition of Chinese fancy.

If one declines to accept all these stories at their full face value and merely regards them as a proof of military activities in certain directions, the which are undoubtedly taking place, the next question of interest is the why and wherefore of it all. What has

possessed Governor Yen Hsi-shan to abandon his customary and apparently very successful policy of peaceful occupation and adopt instead the attitude of a *tuchun* who bases his power on the mailed fist and the rattling of the sword.

The answer is simple! Governor Yen likes his job and his province, having successfully held them ever since the first days of the revolution, and he has not the slightest intention of parting with them now if he can help it. On the other hand, ever since the establishment of the Tsao Kun administration, plot after plot has been set on foot by some militarist or politician who desired the post of governor of Shansi for himself or some relative. These endeavors, if they have not received the open support of the president, have at least not been frowned upon by him, partly on account of the indifference displayed by Governor Yen during the recent struggle for the presidency and partly from the unfortunate necessity of finding suitable posts for certain of Wu Pei-fu's followers, while it is also stated that the anti-opium campaign so ably maintained by the model governor is extremely distasteful to His Excellency Tsao Kun and his friends. Up-to-date Shansi has managed to retain Yen in his post by the payment of a monthly sum of $10,000 to the war-chest of the Chihli party, but recently a demand was addressed by them calling for an increase from $10,000 to $20,000 per month, with the alternative of the replacement of Governor Yen Hsi-shan by some other nominee who would be more amenable, or shall we say less scrupulous in draining the resources of the unlucky province. This ultimatum has hardly had the result desired apparently, for governor Yen seems to have decided to hold his job *manu militari*, and therefore to have suspended all payments whatever, at the same time pushing forward all possible military preparations. It must be admitted that war material ex Taiyuanfu arsenal is not a very deadly threat, to the enemy at any rate, but when taken in conjunction with the natural advantages possessed by the province it would appear to be more than the Chihli party or its nominee for the post may care to tackle at the moment. Shansi is more or less economically self-supporting, while it is bounded on the west by the Yellow river and on the north by ranges of unpopulated hills where both lack of water and lack of supplies would render a campaign extremely difficult if not impossible. The only real avenue of approach is via the narrow gauge railway, and the passes *en route*, as the writer observed to Governor Yen's chief of staff some eighteen months ago, are easily defendable and if held render the railway useless for an invading force. Of course all intercourse with Peking and the south would be severed at the junction of the Peking-Hankow Railway at Shihchiachwang, but that would not be a matter of vital importance to Shansi merchants for a few months, and it is very doubtful if a blockade of this nature could be maintained for any lengthy period of time. All in all it would seem that Governor Yen has taken the best way of dealing with a difficult situation, and in view of the fact that his province is by far the best administration in China at the present time it is to be hoped that any overt threat on the part of the militarists will recoil upon themselves, as undoubtedly it will if only the people of the province of Shansi stand firmly behind their nominee, at the same time enlisting on their behalf all the support which liberal and democratic opinion in China can give.

A Big American Belittled

Sidelights on the Campaign to Kill an American Loan to Japan

An Appreciation of Cyrus E. Woods

DURING the great war the United States was represented in China by a diplomat who in order to force Peking into the conflict on the side of the allies compromised his government to a definite policy at the peace conference and when the force of circumstances compelled President Wilson to accept a different solution, the American minister promptly tendered his resignation in a letter calling for a " show-down " with Japan and entered the service of the Chinese government as its High Adviser. During his tenure of office, Dr. Reinsch built up an organization whose propaganda has done more to sow the seeds of ill-will and future wars than all other influences combined. To this group, Dr. Reinsch was a man who could do no wrong; his resignation and acceptance of a post under the Chinese government exemplified the highest type of moral courage, the act of a super-patriot. This organization still exits, and loses no opportunity to throw mud at Japan and belittle any American who has a good word to say for that country or its people. It is admitted by many American diplomats that it will take many years to undo the mistakes of Dr. Reinsch. When the present administration came into power the war clouds hung very low over the Pacific. It required diplomacy of the highest order to avert a disaster. Ambassador Warren had a difficult task in Tokyo paving the way for Secretary Hughes to clear the atmosphere through the Washington conference. After Warren, came Cyrus E. Woods determined to supplement the good work of his predecessor by drawing the two nations more closely together in the bonds of commercial co-operation. Woods did his work nobly and well and when the earthquake and fire bowed the Japanese in profound sorrow, he won their eternal gratitude by the manly, frank and open-hearted manner in which he strove to turn the calamity into a blessing. He was the right man in the right place, an honor to his country, and to its traditions. When the senate passed the immigration act with its Japanese exclusion clause, the usefullness of Ambassador Woods came to an end. He made a speech deploring the hasty action of the senate and sent in his resignation. Every newspaper in the United States which has commented editorially on his resignation, commends his action.

" It is no secret " says the *Philadelphia Evening Public Ledger*, " that Ambassador Woods is returning home after a hopeless but gallant fight to preserve American dignity and honor." *The Richmond Times-Dispatch* says there was nothing else for him to do." Woods, knowing the Japanese aims and Japanese character better than any congressman possibly could know them, knew congress was wrong. He said so publicly. And the thinking people of the country know congress was wrong." *The Bridgeport Telegram* says that " the slap in the face which the United States senate gave to Japan could not but have the effect of nullifying his efforts." *The Auburn Citizen* says that " the old theory prevails that, if the home government adopts a policy contrary to the advice of the diplomatic agent and which in his estimation endangers its good relation with the government to which he is accredited, he has failed in his mission and lost his usefullness. It is quire understandable that Mr. Woods feels this to be true in his case." *The Brooklyn Citizen* says that Ambassador Woods has taken the only course an honorable man could take when he resigned his post as a protest against the adoption by congress of the bill excluding Japanese immigration." *The Chicago Post* says that the " sort of diplomacy which seeks to promote good feeling has been rebuffed." *The Columbus Journal* commenting on the frequent change in ambassadors says " in the present strained situation it can be considered only as deplorable that a new man must be sent to the important post in Japan." *The Reading Tribune* prints an editorial supplied to many newspapers by a special service which says : " expressions of regret come from editors all over the country who feel that Ambassador Woods has rendered notable service in the Orient and that his influence would mean much toward preventing a rupture of friendly relations between the American and Japanese people if he would remain in Tokyo." *The New York Evening Post* suggests that " those who realize how earnestly Ambassador Woods has labored, how much he had accomplished and what high hopes were his, will note that two weeks before May 1 the senate of the United States had destroyed much that he, his predevessors and a generous nation had done through many years." Another editorial which appears in many Middle-western papers, says: " Some Americans

may sneer at the friendly feeling in Japan for Ambassador Woods, and say that he was too considerate of Japanese interests. Yet perhaps the most serviceable envoy to another country is a man who can understand and sympathize with that country's viewpoint and, instead of antagonizing it, try to make his fellow-countrymen understand it and labor for a friendly compromise.

We might go on quoting American editorial opinion commending Ambassador Woods ; we might reproduce the words of President Coolidge praising his work in Japan, but we merely emphasize that not one American editor has suggested that his resignation was anything but spontaneous on his part. It remained for the editor of the so-called American newspapers in Shanghai to circulate the innuendo that the resignation of Ambassador Woods was asked for by his government. In gazing out of the East Window of *The China Press* on July 20 its editor gathered from the ether the following thoughts on the reasons for the retirement of Ambassador Woods :

" Immediately after the passage of the U. S. immigration law restricting the migration of Japanese coolie laborers and agriculturalists to the United States, the American Ambassador got up and made a speech before a Japanese audience. Instead of explaining to his Japanese listeners just what the new law meant and how it represented the culmination of efforts extending over nearly a half century on the part of the American Government to limit immigration, the American ambassador made a rather violent speech attacking congress for its action. He resigned a few days after this oratorical effort—the announced reason being that he was forced to return home on account of the illness of his mother-in-law."

If the editor of *The China Press* had cabled to anyone of his fellow alumni in Tokyo they would have told him that the public announcement of the resignation of Ambassador Woods was held back for over two weeks, during which time secretary Hughes was almost peremptory in requesting Mr. Woods to reconsider his decision. Mr. Woods did his best to comply with the urgent commands of the secretary of state and subordinate personal feelings to duty. It was, however, impossible for any self-respecting diplomat to remain on a job after his own government had destroyed his usefullness, so reluctantly and with a heavy heart he insisted upon resigning.

The China Weekly Review, is edited by the editor of *The China Press*, and in its issue of June 21, devotes a column to the retirement of Ambassador Woods. It says :

" In view of the fulsomeness of the entertainment and farewell functions and messages of friendship and esteem which were heaped upon U. S. Ambassador Cyrus Woods by the Japanese organizations and the Japanese press prior to his departure for America recently we can't help but agree with the Japan *Chronicle* that " it is time for Mr. Cyrus Woods to pray to be saved from his friends of the Japanese Press." Americans residing in China are supposed to be under a handicap in their ability to view impartially Japanese affairs affecting America, or China either for that matter, so with this disqualification we will try to consider the case of Mr. Woods. Mr. Woods was appointed American Ambassador to Japan following the retirement of Ambassador Warren. During the earthquake disaster Mr. Woods made a fine record not only for himself but for his country due to the enthusiasm with which he engaged in relief work in spite of serious personal and domestic troubles, one member of his family having been seriously injured. After the earthquake he returned to Washington, *presumably* to report to his government regarding the situation in Japan. While he was in Washington the newspapers published the accounts of the Japanese atrocities toward Koreans and Chinese during the earthquake excitement. After reading these reports Mr. Woods gave out an interview to the press condoning these reports and questioning their accuracy."

Right here it is well to state a fact, which we suspect the editor of the *China Weekly Review* is not entirely ignorant of. One of the motives which influenced Ambassador Woods to return to the United States so soon after the earthquake and about which there is no conjecture, was to accurately inform his government as to Japan's financial needs and resources in order that a reconstruction loan could be successfully floated on the American market. This visit was deemed essential in order that Mr. Woods could personally counteract the activities set in motion to prevent the flotation of such a loan. A very complete but utterly misleading report on Japan's financial condition had been prepared for transmission through official channels to Washington for the purpose of destroying any possibility of an American loan to Japan. This report bore all the ear-marks of having been inspired by someone intimately associated with the anti-Japanese element in China. Woods discovered a " nigger-in-the-wood pile and took no chances of having his work destroyed. He went to Washington, and there paved the way for the successful flotation of the loan which linked the two countries tightly together in bonds that are difficult to break. At all times his efforts were being opposed by a propaganda which seemed to have its origin in Shanghai. Press dispatches signed by Mr. J. B. Powell, correspondent of the Chicago Tribune Service at Shanghai openly denounced the loan as a menace to the open door doctrine and in other ways tried to antagonize Americans against lending money to Japan for reconstruction purposes. That Woods frustrated this little scheme to prevent an American-Japanese *rapprochement*, is sufficient reason for this anti-Japanese American to belittle him. Now let us follow the concluding remarks of the editor of *The China Weekly Review :* "

" Upon his return to Japan, the question of the Immigration Law came up in congress and naturally Mr. Woods feared that the passage of the legislation including the Japanese exclusion clause might interfere with the friendly relations of Japan and the United States. This was all right and no one could blame him for this feeling, but he made the mistake of delivering a public speech in Tokyo in which he condemned congress for its attitude. A few days after a report of this address had been cabled home Mr. Woods announced his retirement as American Ambassador to Japan, giving the reason as anxiety regarding the health of his mother-in-law who had been injured in the earthquake. Whether Mr. Woods resigned or whether he was recalled we do not know, but his return to his home land has given occasion for the Japan *Chronicle* to comment upon an editorial reprinted in Japan from the New York *World* to the effect that there are two kinds of ambassadors, those who convey the desires of their home government to the countries to which they are accredited and those who convey to their home governments the dispositions of the countries to which they are accredited."

Again there is the doubt as to the reasons for Mr. Woods' retirement. There was, however, one little item of news connected with Ambassador Woods' tour of duty in the Far East which the editor of *The China Weekly Review* very carefully overlooked. Immediately after the return of Mr. Woods to Japan, he started on a visit to Manila to confer with Governor General Wood. There he was received as befitted his rank of ambassador and second highest American officer in the Far East. On his return to Japan he stopped one week in Shanghai at the leading hotel.

Had the British ambassador to the court of the Mikado honored Shanghai with his presence for one week, his nationals would have met him at the wharf with a military guard of honor to escort him to his temporary residence. The British chamber of commerce and other bodies would have vied with each other in honoring him in various ways. The American Ambassador to the court of the Mikado, the second ranking official of his government in the Orient, arrived in Shanghai unannounced, was received by the consul-general, driven to his hotel and for one solid week not one prominent American came near him. Why ?

Perhaps the editor of *The China Weekly Review* and *The China Press* can answer this question to the satisfaction of other Americans who resent the slight to Ambassador Woods when he passed through Shanghai. If not, we will answer it. Cyrus E. Woods was friendly to Japan. He turned the earthquake into the means of cementing the relations between Japan and America in everlasting friendship. He killed the intrigue to deprive Japan of an American loan.

He went further. He brought certain facts to the attention of the president and secretary of state and in a large measure contributed towards the drafting of the Executive Order signed by President Coolidge, which amongst other things put a stop to interferences with delicate international questions on the part of American commercial associations abroad a fact which has been carefully excluded from the columns of the *China Press* and *China Weekly Review*.

It is not difficult therefore to sense the reasons which have influenced the editor of these newspapers to belittle the work of Cyrus E. Woods. No American friend of Japan no matter how great his position, how honest and honorable his intentions, can hope for decent treatment from these newspapers.

* * *

Small Town Journalism

The Fourth Estate under date of March 15 prints the following interesting news item :

" Dr. Henry W. Luce, vice president of Peking University, has consulted Director H. F. Harrington of the Medill School of Journalism of the Northwestern University for advice concerning the plans for a Chinese school of journalism. Dr. Luce said that he had been advised to come to the Medill school because it united the metropolitan view of the Pulitzer School at Columbia University and the small town newspaper viewpoint fostered by the University of Missouri. This combined type of school is what he believes will be most successful in China."

Dr. Luce concludes his interview with the startling information that " there are two kinds of news in China, one hard news, solid facts, and the other soft news, entertaining features." If the Medill system will turn out Chinese newspapermen with a metropolitan viewpoint and the ability to dig up hard news and solid facts, instead of aspirants for editorial positions endowed with the small town news paper outlook and a propensity for writing soft news, gush, and downright dribble, the Peking school will fill a long felt want. Turn them out, hard-boiled, Doctor.

* * *

Paper from Bamboo

THE 1923 report of the acting secretary for agriculture, S.S. and F.M.S., Mr. G. E. Shaw, contains a reference in its notes on the minor crops which have been the subject of local experiment that is of very considerable interest if read in conjunction with reports of similar researches, carried to a far more advanced stage, which are to be gathered from Madras papers to hand by this week's mail. We refer to Mr. Shaw's remarks under the heading of "Paper Pulp." "Considerable advance," he writes, " has been made by the agricultural chemist and his staff in their experiments with pulp from bamboos, Ialang grass, and foreign grasses grown for purposes of investigation at Serdang. A very excellent bleached pulp has been obtained from at least one of the bamboos."

That is excellent news so far as it goes, says the *Malay Mail*, and we shall hope to hear in time that the pulp is obtainable in sufficient quantities, and is producible under such conditions of manufacture, as will bring the financing of its production on a commercial scale within the sphere of practical politics. That good grades of paper can be made from certain varieties of bamboo and plants of kindred species is, of course, no new discovery, as was demonstrated years ago in India. But though we have heard of several tentative efforts being made of late years to launch a new industry on these lines in Madras, Bengal, and Burma, various technical and economic difficulties appear to have arisen in the course of most of these undertakings which have hindered the achievement of the real commercial success aimed at by their projectors. In this connection the investigations now in progress in the Madras presidency are of great interest. The particular variety of Indian bamboo known as " eta " reed has given really gratifying results, judging by the joint report of the chief forest engineer and Mr. W. Raitt, the Indian government's paper pulp expert, who declare that its product is likely to command better prices either than wood-pulp or ordinary bamboo pulp. Very large areas of it are available in the natural state, and as it reproduces itself on the ground every 3½ years under conditions that appear not to necessitate special cultivation, a perpetual supply is assured so long as it is worked in blocks under rotation. When its growth is contiguous, as appears to be the case in the Tinnevelly district, with natural water power of a type suitable for hydro-electric installations, paper production under the cheapest conditions conceivable will be a comparatively easy matter, or so at least the Madras government appear to think, and their optimism is supported by the views of experts. It may be added that another " side-line " contemplated is the manufacture of matches, in which " eta " reed has been utilized for years in Southern India. As the amount of reed used for matches is comparatively small, the match industry is expected to work very profitably in connection with a pulp-plant, the selected reeds being used for match-making and the waste from match plant, which will be considerable, being used for the manufacture of paper-pulp. It is, therefore, believed that the two industries, both using the same raw material, can be worked very economically in conjunction with each other.

More Oil

That Secret Russo-Japanese Treaty

THERE are many urgent political and economic reasons why Japan should compound her difficulties with Russia as soon as possible. Before his elevation to the premiership Viscount Kato urged the evacuation of Siberia and Saghalien as a preliminary step to a Russo-Japanese agreement, while Viscount Goto has practically staked his political career on bringing this about. No Japanese statesman, however, is willing to jeopardize his reputation at home and abroad by entering into a secret preliminary treaty whereby Japan is to equip Russia with the arms and munitions that would solidify her position in Eastern Asia and compel Japan in turn to increase her own military establishment. To suggest that Japan and Russia have entered into a secret treaty that would place Russia once more in a position to push forward her aggressive designs in territories which imperil Japan's vital lines of defense, in order that the Japanese navy might be conceded the privilege of sharing in the exploitation of Saghalien's doubtful oil reserves, is only another way of saying that Japan considers the menace from the sea to be more urgent than the " menace from the direction of Urga."

That influences are at work to create such an impression is plainly evident from the news dispatches sent to the *New York World* on June 18 by Alfred M. Murray, its Paris correspondent, and qualified by Moscow in an interview with *The New York Times* correspondent, as " utter rubbish." A month and a half later, the Paris correspondent of *The Morning Post London* picks up the same story and gives *Reuter's* the opportunity to spread it throughout the Far East, Reuter's however, circulated on the same day the statement of the Japanese government, that the report was " utterly false."

The original report sent *The World* by its Paris correspondent said that he had learned through " diplomatic sources " the provisions of a secret treaty of far-reaching character which was to be signed by Russia and Japan in which the latter was to furnish Russia with heavy artillery and war-ships, including vessels which should have been scrapped under the terms of the disarmament treaty. In return Russia was to cede to Japan all rights to the oil fields of Saghalien in order that the Japanese fleet might be independent of other oil supplies.

" Utter rubbish," was the curt reply of Theodor Rothstein, head of the Soviet press bureau at Moscow to the inquiry of the correspondent of *The New York Times* concerning the authenticity of the report. Rothstein, who in addition to being head of the press bureau is a member of the presiding committee of the Soviet foreign office, where he ranks fourth from Tchitcherin, said that the whole Paris report was preposterous, that negotiations with Japan appeared to be proceeding favorably.

Regarding Sakhalin, Russia continues to maintain its demand for Japanese evacuation, and the Japanese appear to be less uncompromising than previously.

From other Moscow sources the *New York Times* correspondent obtained confirmation of the favorable progress of the Russo-Japanese negotiations. The Japanese are said to be willing to return North Sahkalin in return for a most-favored-nation agreement regarding subsequent oil concessions. Russia is said to be willing to admit the principle of cash compensation for certain Japanese victims in the Nikolaievsk affair, which was made the pretext for Japan's seizure of North Sakhalin. Japan further is to receive important fishing privileges in Russian Pacific waters. There would be nothing intrinsically impossible in the Russian purchase of Japanese war material should Japan be willing to sell or rent small coast defense vessels, athough it was said to be more probable that Japan would sell her merchant vessels, which are greatly needed in Russian Asiatic ports, owing to the wholesale removal of old merchant fleet by the " whites."

Notwithstanding this denial, by the Soviet *The Morning Post* correspondent at Paris revived it on July 31. In denying it, Tokyo states that the report is being sytematically circulated for ulterior reasons and our own observations tell us that no newspaper in America commented on the original news dispatch and that after its denial in the *New York Times*, it died a natural death. The only

newspapers which considered the report worthy of credence have been the anti-Japanese organs published in China which grabbed the " news " as a choice morsel for editorial comment and then ignoring completely the denial of the Japanese government, regaled their readers with further insinuations about Japan's backstairs diplomacy on the receipt of the Reuter's dispatch.

Japan is having a hard enough time as it is arriving at some equitable arrangement with Russia and there is every reason to believe from official statements that one of her basic conditions is the cession of important oil rights in northern Saghalien. The American public has been told on more than one occasion that it would have to fight Japan because of her forcible usurpation of rights ceded by the Soviet to an American oil company. The present trend of Russo-Japanese negotiations towards firmly establishing Japan's rights to participate in the exploitation of these deposits, would therefore materially damage the prospects of the American company to a monopoly in the disputed territory. It would be most interesting and enlightening to know the exact origin of the story communicated to the Paris correspondent of *The New York Times* and a month and a half later to the Paris correspondent of *The Morning Post.*

It was only a few months ago that two American surveyors representing the Sinclair oil interests attempted to enter the northern section of Saghalien to prospect the concession granted by the Soviet and were turned back by the Japanese military authorities. Their treatment was most courteous, but they were given firmly to understand that while the Japanese army was in supreme command of the administration of Saghalien, Americans would be forbidden to invade the island to prospect for oil. The incident emphasized that although Japan recognized Russia's sovereignty in northern Saghalien, she insists upon retaining possession of the territory as a guarantee for satisfaction for the massacre of 700 Japanese by the Soviet at Nikolaievsk in 1920. This attitude is quite comparable to French occupation of the Ruhr and has other historical precedents to justify it.

Japan's oil reserves, never very large, have been dwindling rapidly. The Akita and Niigata fields are becoming exhausted, the output decreasing year by year while the demand is steadily increasing. At present, half of Japan's oil supplies are imported and because of the high market price many large Japanese manufacturing plants which were preparing to use oil as fuel discovered that it was dearer than coal and abandoned their projects. The Japanese navy oil reserves destroyed last September in the earthquake and fire made it imperative for the nation to become independent of foreign importations and develop its supplies in territories near at home.

Aside from the diminishing domestic fields and the shale deposits of South Manchuria the only place which offers Japan a possibility of freeing herself from foreign oil importations lies in northern Saghalien. It is not strange, therefore, that every effort is being made to prospect and develop these deposits while the territory remains under Japanese military occupation. An enterprise known as the Hokushin Kabushiki Kaisha (North Star Company) was created by a combination of the Mitsui, Mitsubishi, Okura and Suzuki interests with a capital of Y.3,000,000 and a subsidy from the navy department of Y.2,000,000, to prospect and work the Saghalien deposits. Three wells are reported to have been sunk and are now producing oil which is being shipped to Japan for the navy. It is highly improbable that Japan will surrender this advantage and it is still more improbable that America will interfere in behalf of a company which was granted an oil concession in Saghalien for the sole purpose of forcing our government to recognize the Soviet and to create difficulties with Japan. The oil scandals at Washington have effectively killed any possibility that Americans will spring to arms in behalf of Mr. Sinclair and his associates in the oil business.

It would be the supreme gesture of the bully, if after stripping Japan of her defensive advantages in China, Manchuria, and Siberia, inducing her to subordinate her naval program to a 5-5-3 ratio, and slapping her face over the immigration law, if we should now intervene to deprive her of a basic necessity upon which rests her ability to maintain a modern war-fleet. If America had embarked upon a definite program to force Japan to fight, this constant weakening of her power of attack might be defendable, but even at that, we reject the idea that any self-respecting American soldier or sailor would take pride in fighting an enemy on such unequal terms. To deprive Japan of her only chance to develop an independent oil supply must in the long run impair her reduced naval efficiency and hand over to America control of the Pacific.

From one angle it might be a good thing for Japan to be deprived of an independent oil reserve. With the Japanese out of the naval race, the American tax-payer would be relieved of huge annual appropriations for the upkeep of a fleet in the Pacific. Our Japanophobe jingoes and strategists would then have to hunt around to find some one else to pick on in order to squeeze the money for armaments out of a reluctant congress. It would then be squarely up to the United States to reduce its fleet in the Pacific and permit Japan to work out her destiny in her own way without facing the perpetual outside menace of interference. With the Japanese fleet emasculated by an inadequate supply of oil fuel there would be no longer any valid reason for maintaining the 5-5-3 ratio of armaments and an end would come to this interminable yapping about war with Japan and calling upon congress for the annual appropriations of millions to maintain the nation in a state of preparedness against a crippled sea power.

It is too much to hope that the elimination of Japan as a first class naval power would satisfy our jingoes. It might deprive them of the argument that the nation must prepare to defend its territory against an Asiatic invasion but on the other hand it would provide a new opportunity for those who consider it our bounden duty to pose as the protector of China to revive the cry for a larger navy in order to defend the open door and any attempt to discriminate against our trade in this country. Despite the fact that our investors have never had the curiosity to see what lies beyond the door that has been held open for them these past two decades, while all this time hundreds of millions of Japanese yen have been pouring into the country to develop its resources and industries, our jingoes will see in this legitimate commercial movement a menace to China's sovereignty and a closing of the door to equal opportunity. The cry for a greater navy will again be heard.

* * *

Trade Follows the Loan

EVER since Wall Street became the money centre of the world, there has existed a difference of opinion as whether international loans should be made with the proviso that the borrowing countries spend the credit in the United States for the purchase of materials, or whether the loan should be a purely financial operation without such conditions. Our bankers, as represented in the consortium, inclined to the view that loans should be made without a proviso for the purchase of American materials. permitting China to purchase her requirements in the open market, At that time, the larger American manufacturers of railway equipment believed they could meet any possible competition for years to come and sided with the bankers.

Although no advances have been made to China for construction purposes, the discussion has again been revived owing to the many international loans floated in America without any proviso for safeguarding the interests of our manufacturers. Commenting on this situation *The Brooklyn Eagle*, says :

> " Borrowers from all over the world are applying for loans. In a few months past Japan, Sweden, Switzerland, Holland and the city of Rotterdam have obtained loans. Others are pending. In a sense New York has been the money capital of the world since the beginning of the world war. And still gold in an unceasing flood is pouring into the country. The connection between gold and the future of our trade should be obvious. New York now has first place. If America desires to keep it, she must take a leaf from Britain's book. Britain gave freely of her gold and brains to develop the world. Many of our great railroads, our flour industry and other enterprises owe their existence to British capital. South America also was developed largely by Britain. So also must the United States lend to foreign nations, helping to promote the standard of living of all the world. The alternative is loss of trade and probably domestic stagnation."

This side of the argument follows the system under which French financiers for many years dominated the world's money market at a sacrifice of national industry. To take a concrete example. France financed at least three-quarters of all the railways in China, yet aside from furnishing the equipment for the Yunnan and Cheng-tai lines, her manufacturers were left out in the cold in the supply of materials for the other lines. French national economy got no returns from its investment other than the interest on the bonds. It was not until January, 1914, that the French manufacturers woke up to this situation and demanded that all future French loans for construction work abroad should provide for the purchase of French materials.

In this they were guided by the British example, who at that time were conducting a vigorous propaganda to have all British loans employed for the advancement of their own manufacturers, overlooking that in many instances, a large proportion of these loans were taken up by French investors. We expressed the opinion at the time the American bankers announced their determination to make loans to China without any qualifying conditions, that American money loaned to China for construction work, should follow the precedent created by Great Britain, otherwise, our manufacturers would get precious little business in an open competition with Europe.

The Saturday Evening Post supports this attitude in its issue of July 5, in an editorial entitled " The Use of International Loans." The article follows :

" Two or three years ago, when we were actively engaged in making foreign loans, the suggestion was advanced that such loans should be made with the proviso that the borrowing countries spend the credit in the United States. There was a considerable body of public opinion holding the view that we should make some such stipulation in support of our export industries, since it was believed that other countries, notably Great Britain and Germany, had done the same thing. This led a distinguished American banker publicly to controvert ' the fallacy that it is good business to compel our foreign borrowers to earmark and themselves spend their credit in this country.' This was in conformity with the traditional concept of a foreign credit—that a credit to one foreign country was in effect a credit to all foreign countries, and that at some future time some one or other foreign country would use it to buy goods from the lender. Accepting this proposition, that a loan would always, sooner or later, in one direction or another, find expression in a corresponding increase of exports, one would still have to assume a continuity of international trade, in terms of comparable prices and exchange rates, if one were to regard the deferred use of the credit in the market of the lender as equivalent to the immediate use. The British are an astute people. Let us observe their present stand on this question.

" Some time ago Great Britain made a loan to India. At the time an amendment was moved to the East India Loan Bill to the effect that 75 per cent. of the sum should be spent in the markets of Great Britain. Parliament rejected the amendment, in accordance with the traditional theory. London is now profoundly shocked to learn that the Indian State railway administration is spending a large part of the loan in Germany, at a time when British industries are partly idle and labor is unemployed.

" The government of Argentina has been negotiating a loan with a syndicate of London bankers. It was recently announced in Argentina that the offer of a loan of thirty million pounds sterling for construction of public works had been made under the stipulation that the materials should be purchased in Great Britain.

" Thus we observe the experienced international bankers of London subscribing to the ' fallacy ' that it is good business to compel foreign borrowers to spend their credit in the country of the lender. Apparently it is felt that circumstances alter cases. The industries of Great Britain want orders now, not next year or in several years. They do not want to wait while Argentina spends the sterling in the United States, then we spend the sterling in Asia and the Asians finally spend the sterling in Great Britain. They want immediate, not deferred, relief from inoccupation and unemployment. Secondly, it seems to be felt that British loans to foreign countries tend to depreciate sterling exchange unless the credits are spent in Great Britain. Finally, it is believed the loans could be used to build up in other countries new industrial plants that would make injurious competition for Britain.

" If the British are adopting the plan of joining trade stipulations with loans, perhaps we should follow suit. It may, theoretically, be possible to prove that this might be advantageous for Great Britain but not advantageous for us. But we shall doubtless make the assumption that what is good for Great Britain is good for us. If the loan is to stipulate the trade in London, the loan ought to stipulate the trade in New York. Perhaps London is making a mistake ; if so, we can afford to have New York make the same mistake, that London makes."

Exactly. *The Saturday Evening Post* is right. Great Britain knows her business. Her bankers do not make many mistakes in lending money for construction work in non-manufacturing countries. They cannot afford it. It is true that British money largely helped to build up American transportation and industries, but it is also true that by our protective tariff system we made it impossible for British manufacturers to compete with our infant industries. The British accepted our loans as an investment and sought their markets in backward countries compelled to purchase their requirements from abroad. There are instances, even here, where they got stung, like in the original loan to the South Manchuria Railway Company, where after lending the Japanese $100,000,000, the latter proceeded to spend it in America, creating for our manufacturers a market which to date has brought them orders to the extent of $100,000,000. It nearly broke up the alliance. Now it is entirely probable that a similar American loan for the construction of Chinese railways without any proviso for purchasing American materials, will do the same thing for Great Britain and other European countries. In fact, the present tendency will throw all these orders to Germany or Belgium. Altruism and philanthrophy will probably prevail when the time arrives to do something tangible in China and Americans will have the satisfaction of advancing the money in order to create a market for European manufacturers that will develop in time through repeat orders into a sphere of commercial influence whose door while technically open will be hermetically closed to America.

* * *

The Underpaid Engineer

In commenting last month on the disposition of the Boxer indemnity funds for educational purposes, we drew attention to the large number of technical graduates turned out annually from the three Chinese government colleges who find it almost an impossibility to obtain work. To this number must be added the annual output of engineers from the indemnity students educated in America. All the railways and many of the industrial and mining enterprises in China have been built with European or Japanese capital and those in charge are not keen on finding employment for engineers whose influence might divert orders for materials to American manufacturers. Japanese controlled enterprises in China employ Japanese technical experts or Chinese educated in Japanese schools, who although loyal to their own materials whereever possible to use them, favor American material for their railways and British material in their textile plants. It is difficult for an American trained Chinese to obtain employment on railways or in industries controlled by European capital.

We have cited this situation on more than one occasion as a reason why American capital should be used in creating enterprises in China that will supplement our educational activities and provide employment for our protegés. The engineer's lot is had enough even at home, where his remuneration is now on a par with the school-teacher or country parson. To keep turning out hundreds of young Chinese engineers and casting them adrift in China without prospect of work, is to further cheapen the profession and make it more and more difficult for those on the ground to prosper. In commenting on the remarkable change in the starvation salary list which formerly was headed by the professor, *The Saturday Evening Post* calls attention to the fact that this distinction is now held by the engineer. It says :

" Engineers, technologists and men of science, taken as a single group, must now be at the top or very near the top of the list of the conspicuously underpaid. We exempt from this classification those engaged in selling and those who occupy high executive positions. We include in it those whose work is strictly professional.

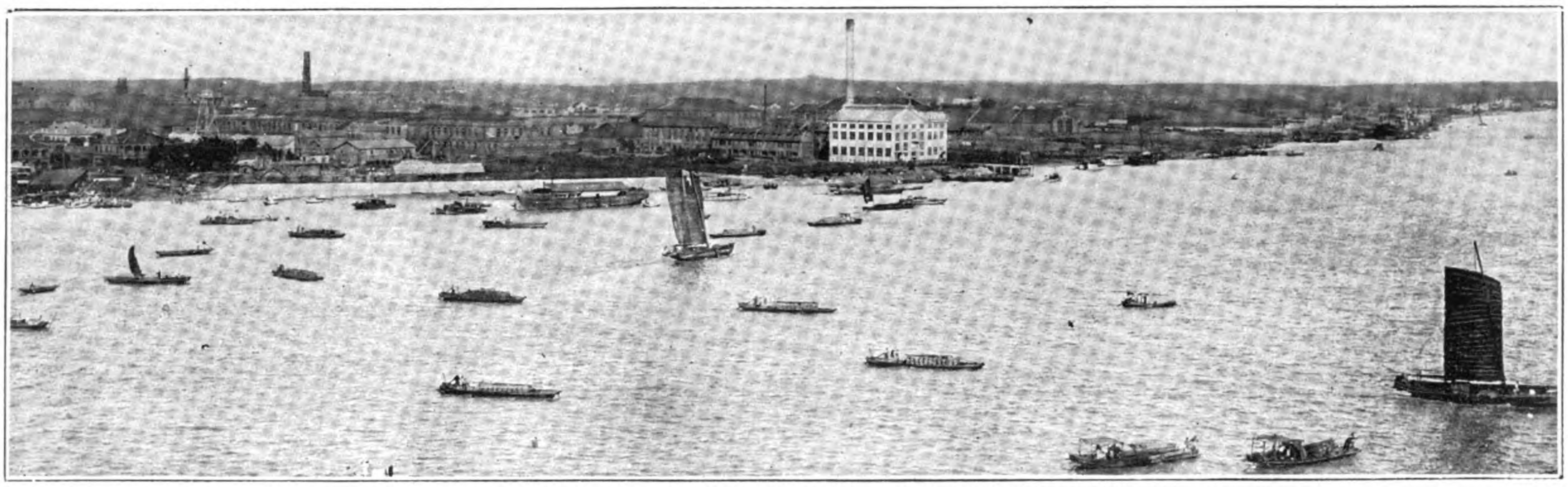
" Bureau scientists in Washington, conspicuous examples of the faithful public servant, work for salaries that a self-respecting plasterer would call cigarette money. Research men in the laboratories of great corporations fare better, but by no means well. Engineering experts in a dozen fields, well equipped specialists, are often so ill rewarded that they find it hard to live in modest comfort.

" Those conditions are beginning to produce the inevitable result. Educators who are trying to assist young men in their selection of a career are telling the truth about the engineering professions and are comparing them unfavorably with other fields of activity. Engineers themselves are equally frank when advising their young friends. Clear-thinking, well-trained young men are too precious an asset to put into blind-alley jobs.

" Scouts from the great industrial corporations each spring look over the graduating classes of our technical schools with a view to engaging promising students. Of late they have been complaining of the insufficiency of the material at their disposal. In some instances they have been frankly told that they want too much for what they are willing to pay and that they cannot hope to find their needs fully supplied until they are prepared to pay a fair price for the costly and hard-won mental equipment whose benefits they desire.

" From colonial times our people have had a genius for mechanics, invention and applied science. It would be a national calamity if we should be so shortsighted as to starve out this priceless talent. If there is any one thing about our social evolution that is certain, it is our growing dependence upon science to solve the problems of peace and war and everyday life. To weaken by neglect or indifference those powers upon which our future existence may depend would be sheer folly."

If such an argument is good for America, where opportunities abound, how much more forcible it is when applied to China. Our present system of educating young Chinese engineers and trusting to the good nature of commercial rivals to give them jobs that will undermine their trade, is to say the least, somewhat foolish. The logical outcome of this system will be to lower salaries to a level that will turn the young aspirant for engineering honors to other fields of usefulness, or to accept jobs where his American training will go for naught. There is only one remedy for all this, and that is the investment of American capital in Chinese industries where our philanthropies will be given an opportunity to advance our trade interests.



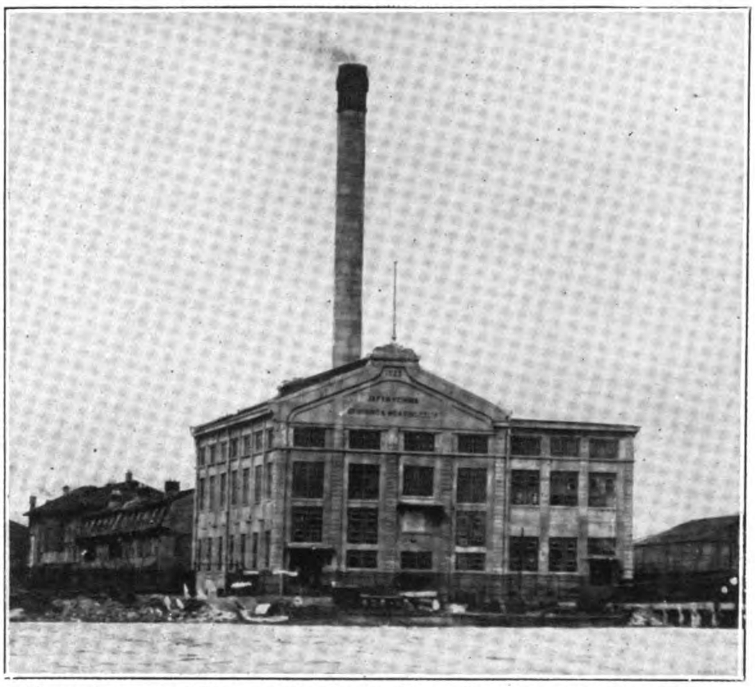
Panorama of Pootung Showing Location of Mills of the Japan-China Spinning and Weaving Company

The Japan-China Cotton Mills at Shanghai

Four British Equipped Mills Now Operated by Electricity

OVER on the Pootung side of the Whangpoo, towers a stack surmounting a building whose impressiveness makes it one of the industrial landmarks of Shanghai. By night a blaze of light, it is by no means a pillar of smoke clouds by day, although it is generating the power for more than 52,000 cotton spindles and 500 looms operated by the Japan-China Cotton Spinning and Weaving Company. Day by day it produces the 2,000 kilowatts that keep the spindles turning and the looms whirring to supply the almost insatiable demand of the Chinese for cotton goods and yarn. This powerhouse with its air of solidity emphasizes in a way the manner in which this and other Japanese owned cotton mills in China are building for a future which even the most sanguine believer in China's possibilities dares not attempt to predict.

Down to date, the Japan-China Spinning and Weaving Company has invested almost nine million yen in its four mills in Shanghai, two on the Pootung side and two on Robison Road. The powerhouse serves both the Pootung mills which were the first purchases of the company in China. They were taken over in 1918 from a British company, the International Cotton Spinning and Weaving Company, and comprised the two mills with about 53 mow of land. The mill buildings themselves cover an area of some 38,000 square feet while godowns and other buildings account for some 15,000 square feet more.



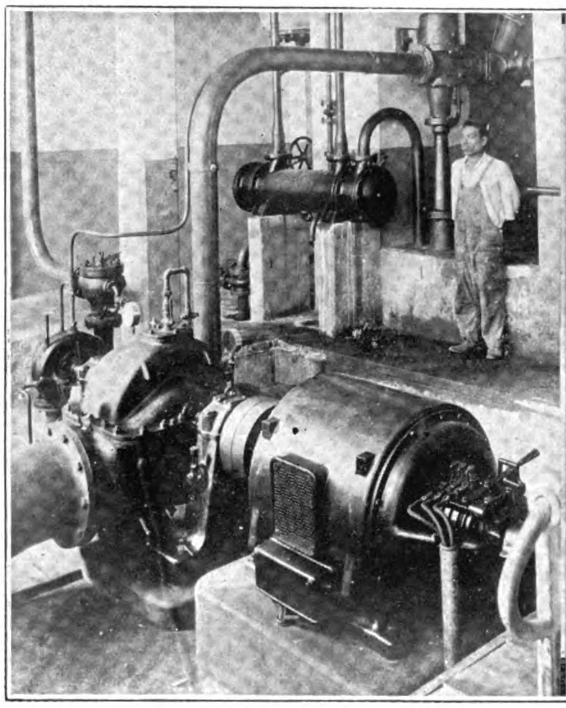
Powerhouse and Mills of the Japan-China Spinning and Weaving Co. at Pootung

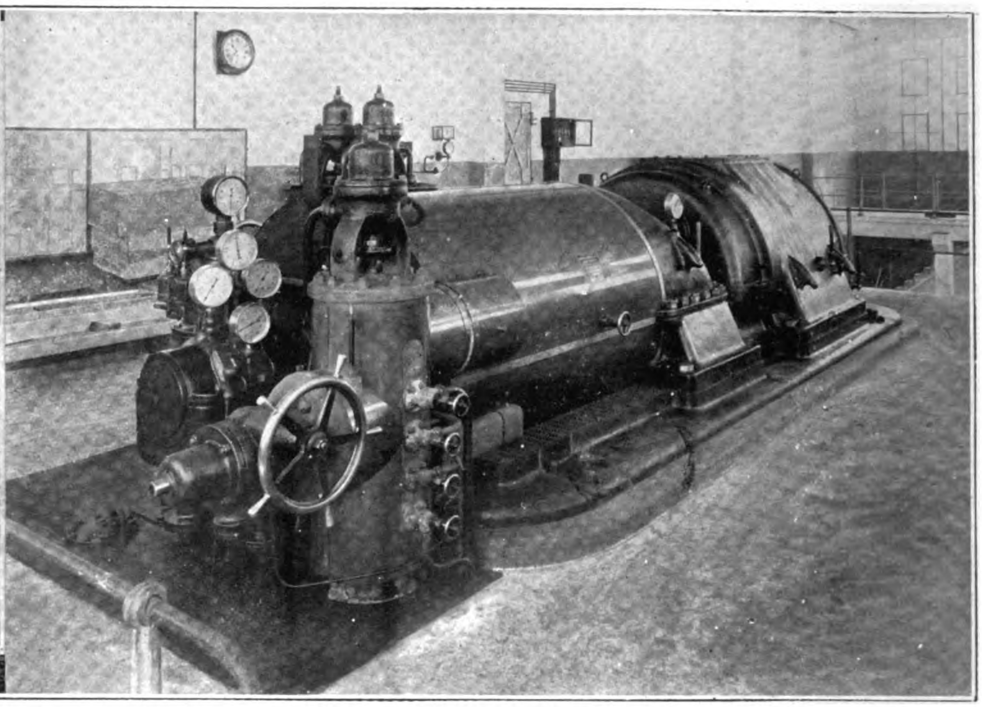
The ample area of ground back of the powerhouse is remarkable in that so much of it is given over to the welfare of the workers. Not only do the actual dwellings for the Chinese employes cover 45 mow of ground, but other cultural advantages are afforded, among which is a commodious church for the accommodation of the large number of workers who have embraced the Roman Catholic faith. They are thus enabled to discharge their religious duties without leaving the mill grounds. Education as well as religion is amply provided for with primary schools where men and women separately, are taught the rudiments of their written language as prescribed by the courses of the Chinese primary schools. The day nursery idea to care for infant children of the women workers also has been put into effect and a commodious house has been set apart for the use of babies and nurses who tend them while their mothers are at work in the mills.

Nor has cultural work been lost sight of the other mills of the company. In the Robison Road mills, Nos. 3 and 4 an area of 69.5 mow has been set aside for residences and workers' quarters, while in Formosa also, the larger portion of the company's holdings is given over to the workers who are furnished with modern and sanitary dwellings. All of the mill compounds of the company have large open spaces to allow for future extensions, the Whangpoo River front of the Pootung mill having more than 28 mow of ground which can be built upon when occasion arises, the total amount of land owned or under lease by the company being some 100,000 tsubo.

The company contributes in no small way to the prosperity of the Chinese working class as it employs in its mills more than 2,000 men and 5,500 women. The average wage for men is fifty cents a day and for women 43 cents, considerably higher remuneration than prevails in some other local cotton spinning and weaving mills. In addition to the factory workers, the company has 156 clerks and engineers and 38 office assistants on its payroll.

The Japan-China Spinning and Weaving Company was organized in Japan in July, 1918. Its original capital was fixed at Y.10,000,000 of which Y.4,000,000 was subscribed. This was the initial venture which resulted in the purchase of the International mills in Pootung, Within 18 months, another call was made for Y.2,000,000 more, making the paid up capital Y.6,000,000. Following this, in June, 1921, the company saw possibilities in the use of ramie fibre for which there was a considerable demand in Japan, and bought the Formosa ramie spinning and weaving mills at Taihoku. The capital was then increased to Y.11,000,000 and a





Electrical Equipment of the Pootung Mill of the Japan-China Spinning & Weaving Co., Ltd.

Brown, Boveri Condensing Plant, Pumps and Ejector — 2,000 k.w. Brown, Boveri, Turbo-Generator

total of Y.6,600,000 was called up for investment. The capital was later increased by calling up an additional Y.2,200,000 and the company now has general reserves of Y.1,525,000.

In July, 1921, the company finished the construction of its No. 3 factory in Robison Road in which 30,000 spindles are installed. Two years later, in June last year, the No. 4 mill in Robison Road also was completed. This mill has 25,000 spindles making the total spindles operated by the company in China some 107,000 aside from the 500 looms at the Pootung weaving plant and the 5,100 ramie spindles and 1,048 doubling spindles operated in Formosa. The mills' spinning and weaving equipments are wholly of British manufacture as follows :—

Pootung No. 1 Mill, 40,400 spindles (Asa Lees)

„ No. 2 Mill, 11,856 (Platt Brothers)

„ No. 2 Mill, 500 looms (Gregson Monk.)

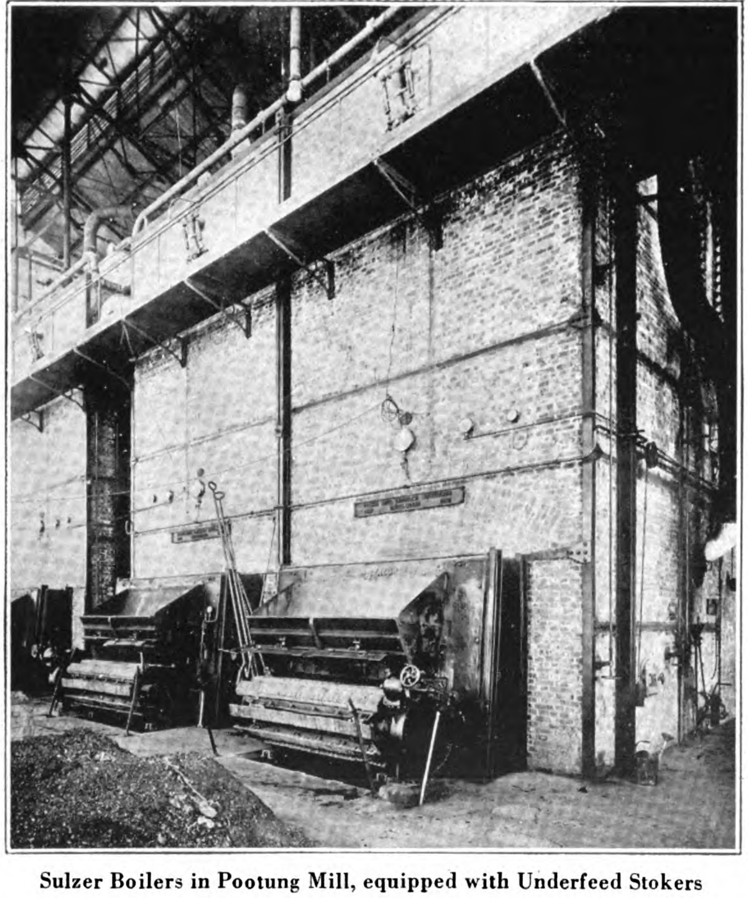
Robison Road Mill

No. 3, 29,952 spindles (Platt Brothers)

No. 4, 25,000 spindles (Dobson Barlow)

Taihoku Mill (Ramie), 5,100 spindles (Greenwood and Batley)

„ Mill (Ramie), 1,048 doubling (Greenwood and Batley)



Sulzer Boilers in Pootung Mill, equipped with Underfeed Stokers

The Power House

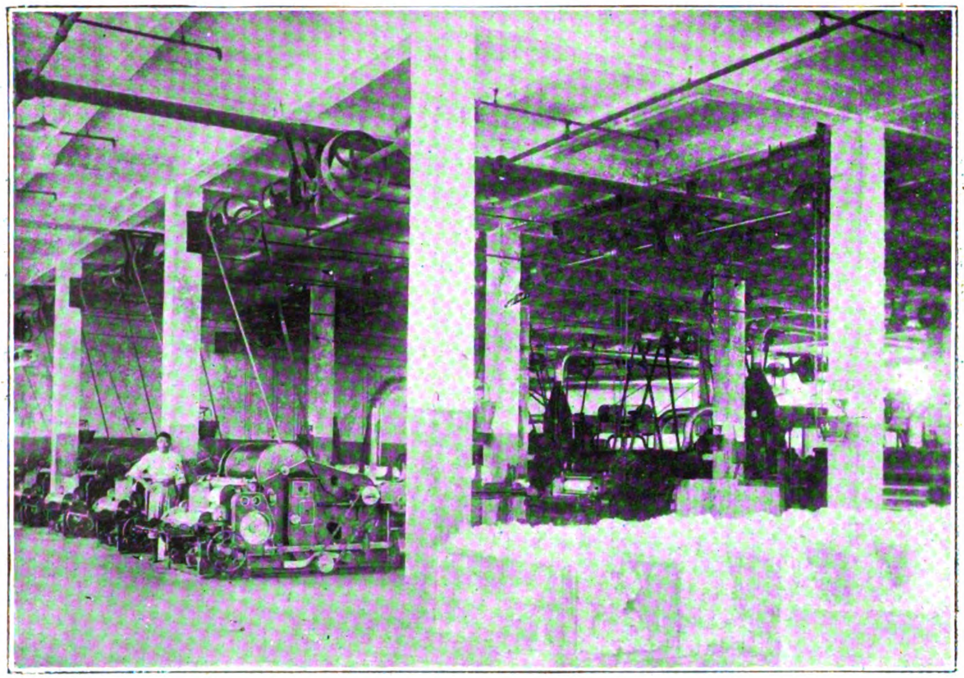
When it was decided to electrify the Pootung mill on account of the case of operation experienced in the other mills of the company through electric drive, the contract for the prime mover, a turbo generator of 2,000 k.w. was given to the Sintoon Overseas Trading Company, Shanghai agents for the Brown, Boveri Company, and the boiler contract to Messrs. Sulzer Brothers of Winterthur, Switzerland. The three boilers are of the Sulzer-Galbe type having 250 square metres of heating surface and operate at a pressure of 200 pounds to the square inch. One of these is kept for spare. The boilers are fed by automatic travelling grate steers made by the Underfeed Stoker Company, Ltd. of London.

The 2,000 k.w. turbo generator is of the standard Brown, Boveri Impulse Reaction type which was developed out of the original Parsons design by replacing the small high pressure reaction blades by impulse blading retaining the reaction system in that part of the machine where it can be used with highest efficiency, i.e., at the low pressure end. This turbine is equipped with the well-known oil pressure governing gear by means of which the steam admission of the nozzles is regulated in such a way that the throttling losses are extremely small. The turbine is built for 200-lb. per sq. in. pressure at the admission valve and 590°F. steam temperature and the specified overload is 25 per cent. The generator is coupled to the turbine by means of a semi-flexible coupling. Its normal continuous output is 2,500 k.v.a. at 2,300 volts.

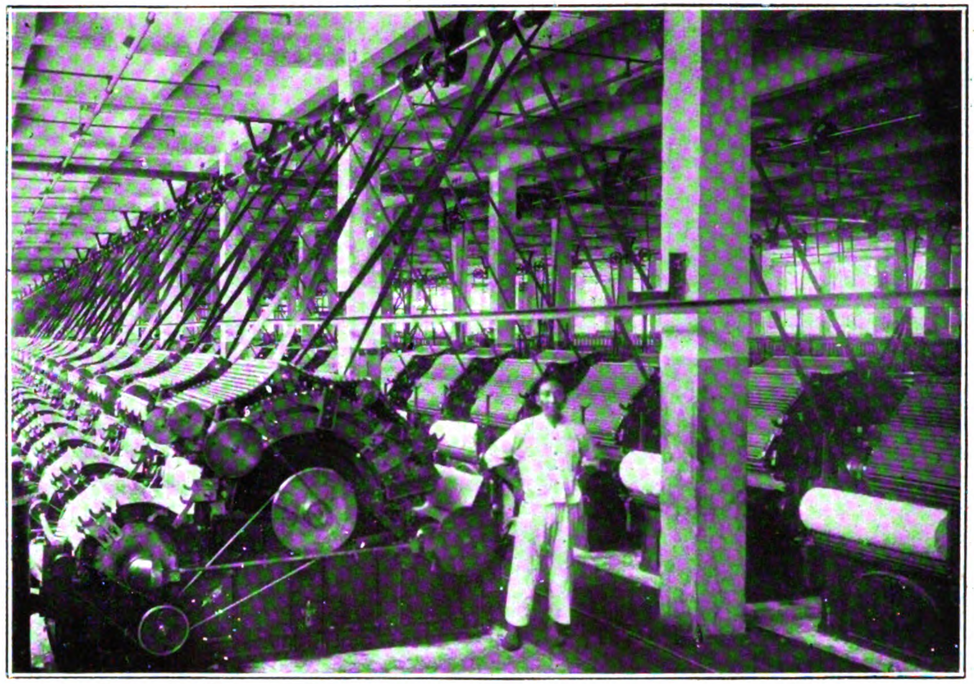
The direct coupled exciter is fitted with special pole pieces making it possible to regulate the tension by means of a shunt rheostat only, the main exciter terminals being directly connected to the rotor of the alternator. The cooling air of the generator is filtered by means of a sectional oil filter which is so built that it can be cleaned during service. The resistance of this filter remains practically constant. The turbine exhausts into a Brown-Boveri patent two-part surface condenser which is so built that it can be opened for cleaning pur-

THE POOTUNG MILL OF THE JAPAN-CHINA SPINNING & WEAVING CO., LTD.

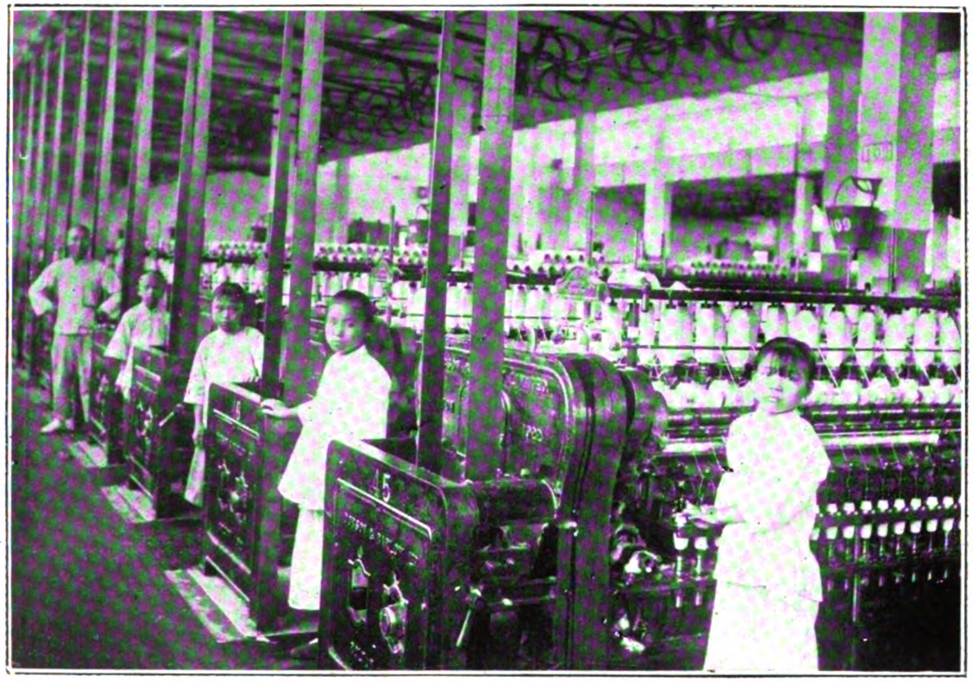
Equipped with Dobson & Barlow, Ltd. Machinery



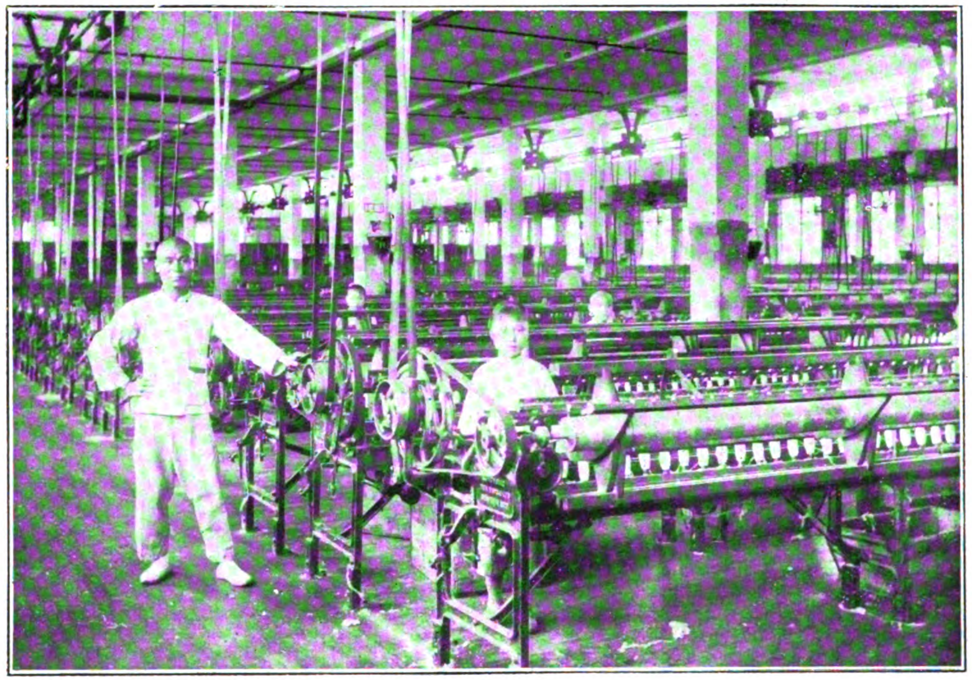
Blowing Room



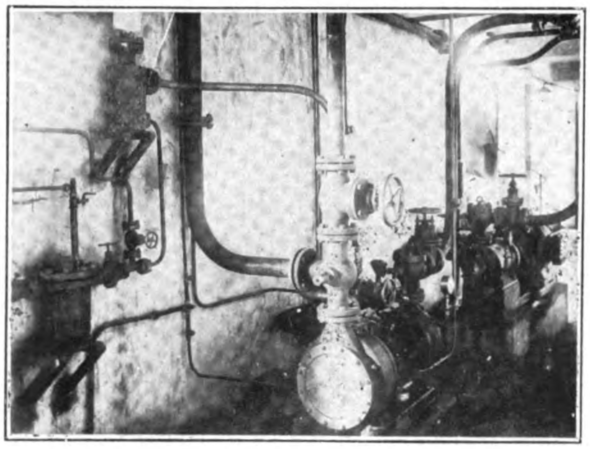
Carding Room



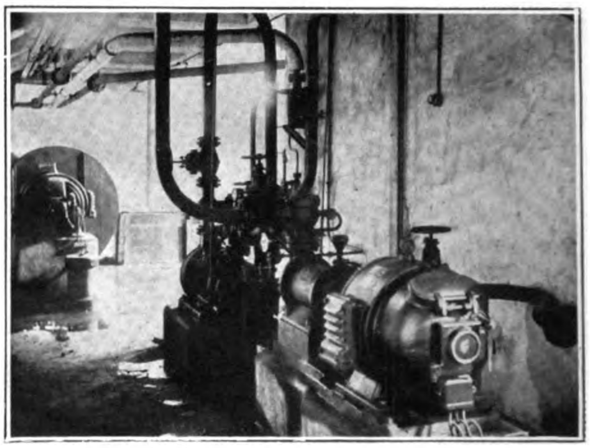
Spinning Room



Reeling Room: Reels Manufactured in Shanghai



Sulzer Steam Turbine Driven Boiler Feed Pump and Electrically Driven Feed Pump

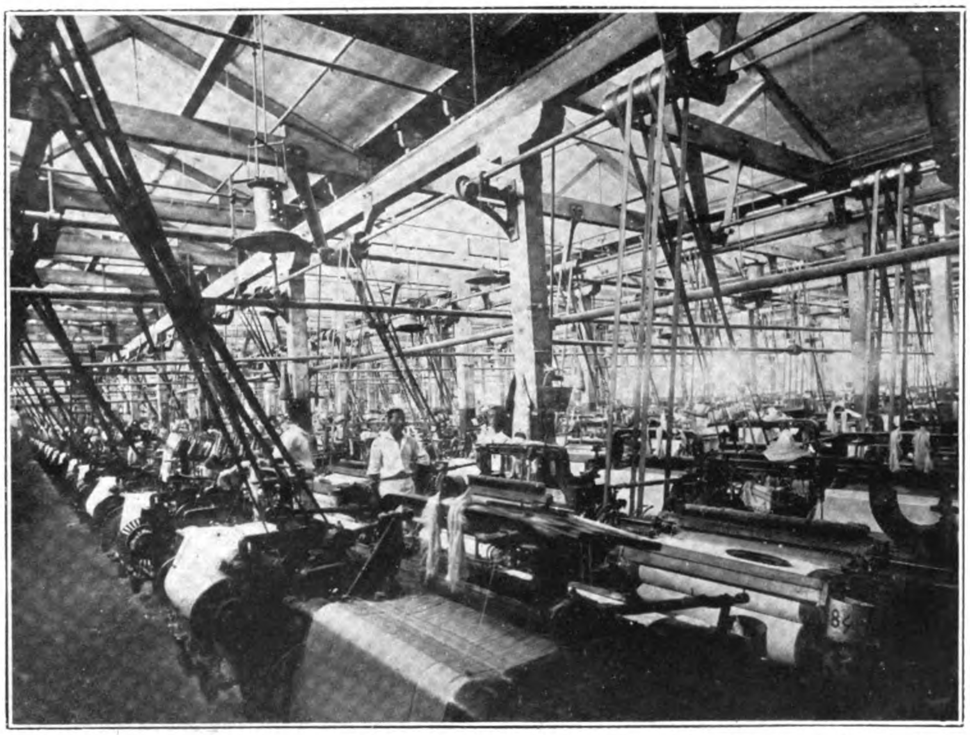


Sulzer Boiler Feed Pump. Sulzer Fan for Stokers in Background

poses without the necessity of shutting down the turbine. This feature is of great importance in a plant using the muddy Whangpoo water for cooling purposes.

The circulating pump, air and condensate pump are all mounted on a single shaft and are driven by a single three-phase slip-ring motor. All three pumps are ordinary centrifugal pumps, the air being extracted from the condenser by means of a hydraulic ejector. In spite of the bad quality of the water and the large variations of the water level in the Whangpoo making the suction head of the pipe at times as much as 23 feet, the pumps work satisfactorily at all tides and the syphonage of the circulating system is easily maintained, the highest point of the piping being permanently evacuated by connection to the hydraulic ejector.

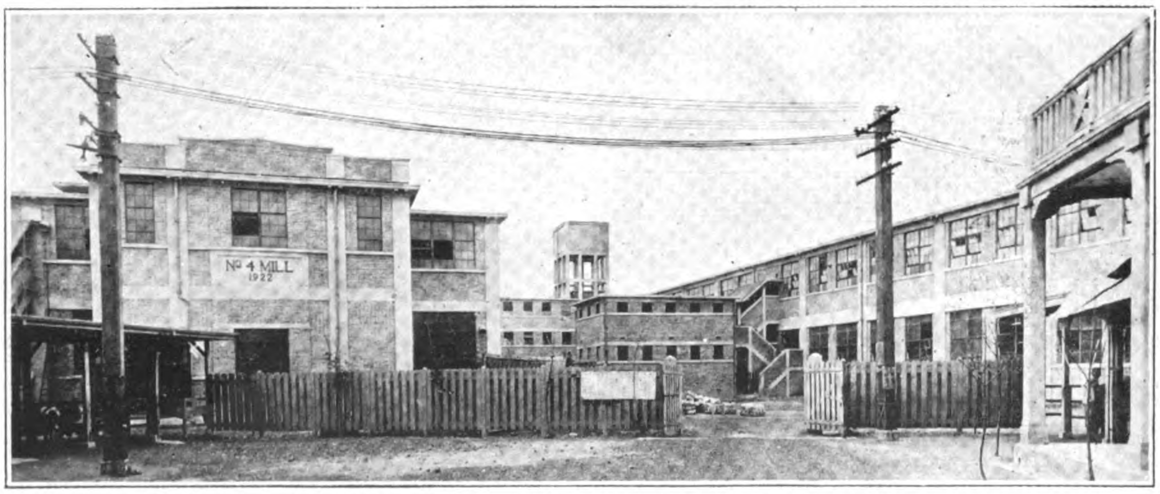
The switchboard, consisting of two generator panels and several feeder panels for the auxiliary services of the power station and for the large motors installed in the mills, is of standard Brown, Boveri construction for 3,000 volts, the high tension apparatus being mounted directly behind the panels and protected by expanded metal doors. The panels themselves are throughout of metal whereby efficient earthing of the operating gear is assured. The usual instruments are provided for measuring the output and checking the operation of the machinery, all being of the counter - sunk type flush with the surface of the panels making the appearance of the switchboard extremely neat. The regulation of the tension is carried out automatically at all loads by means of a Brown, Boveri quick acting automatic tension regulator so that the switchboard needs absolutely no attendance other than the reclosing of the feeder circuit breakers in case of disconnection by the overload and time limit relays provided on each switch.



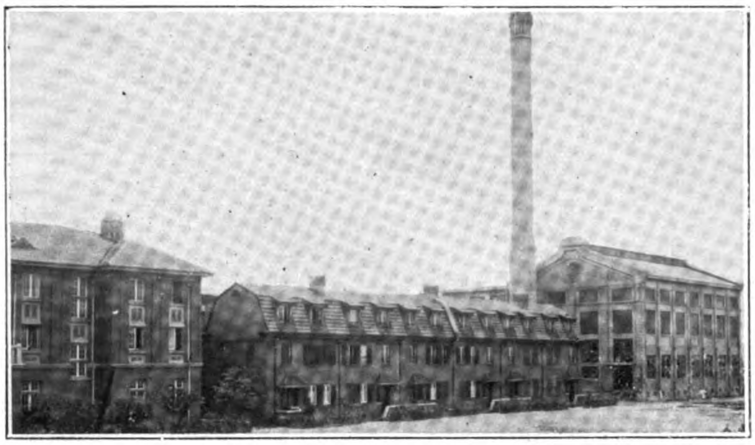
Weaving Shed of the Pootung Mill of the Japan-China Spinning and Weaving Co., Ltd. Equipped with 500 Gregson and Monk Looms

The tests carried out on the turbo generator, which were combined with the evaporation tests of the boilers, where fully successful in every respect, a steam consumption of 11.7-lbs. per kilowatt hour being measured at full load; the temperature rise of the turbo-generator was considerably below the standard figure for such machinery and the overload capacity observed for the turbine being only limited at 2,700 k.w. by the measuring capacity of the instruments available. Both during these tests and in actual industrial service at part loads the oil pressure governing system has shown itself particularly well adapted to the needs of this type of power station, the absence of throttling losses making it possible to run the plant very efficiently even at half load.

In addition to the turbo-generator plant the Pootung mills' electrical equipment includes four 350 horsepower motors made by the Shibaura Engineering Works of Tokyo and three 150 horse-power motors supplied by the Westinghouse International Electric Company. Other small motors up to 50 horse-



Tsaokiatu Mill, Nos. 3 and 4 located on Robison Road, Shanghai



Power Station, Office and Residences of the Pootung Mill

power are by various makers. Electrification of this mill was finished in March this year.

Electricity for the Robison Road mills is supplied by the Shanghai municipal electricity department to 24 motors of 75 horse-power each, made by the Shibaura Engineering Works, as well as to the smaller motors of which many are in use. The Formosa mill also is electrically driven, power being supplied by the Formosa Electricity Co., Ltd , to the two 50 horse-power motors made by the Kawakita Electric Works of Osaka.

The Shanghai and Pootung mills of this company operate almost entirely on Chinese and Indian cotton, using 100,000 piculs of the former and importing 220,000 piculs of the latter annually. The Formosa mill spins 600,000 kin of ramie fiber a year. For these raw materials the company expends some Y.26,000,000 a year. The output in cotton yarn is 80,000 bales marketed under the *Blue Phoenix*, and *Phoenix* chops for 10 to 16 counts, and *Flying Eagle in Cloud* for the 20 counts. The yearly output of yarn is valued at Y.23,500,000. The sheeting output of the Pootung mill is of the 11-pound grade and amounts to 300,000 pieces annually, with a valuation of Y.2,800,000. The ramie yarn aggregates 25,000 bundles valued at Y.750,000. The total valuation of the company's output is therefore about Y.27,050,000. The cotton products are sold in Canton, the Yangtsze valley, Manchuria, Tientsin and the East Indies, while the ramie yarn finds its exclusive market in Japan.

The officers and directors of the company are President ;—M. Kita, Esq. ; Director-in-charge, T. Tanabe, Esq. ; Director and Manager,—K. Ochi, Esq.; Chief-Engineer and Director,—R. Oshima, Esq. ; Directors :—Messrs. K. Kawasaki, T. Ito, S. Hibiya, K. Yano, M. Mochida. Auditors : Messrs. T. Nomura, J. Uenoyama, T. Sone.

Japan's Electrical Power

FOR the first time since the seismic disaster in Japan in September, 1923, the department of communications has issued a report on the conditions of electrical enterprises in this country in July, to be followed by monthly reports. According to the report, there were 834 electric companies, including electric railway companies, on May 31, this year, of which 738 were in operation, 96 bring out of business. The details are :

Companies.	Light and power	Tramways	Light power and tramways
Operating	629	56	53
No operating ..	63	33	—
Total	692	89	53

Compared with December, 1923, four more companies were in business, while three more had ceased operation.

The power generating capacity at the end of May stood at 1,543,472 k.w., of which 1,217,994 k.w., was hydro-electric, and 325,478 k.w., steam generated. Following are the details :

Power plants.		Light and power supply	Electric tramways	Light & power supply & Electric tramways.
Completed	hydro	.. 810,510 k.w.	1,674 k.w.	405,810 k.w.
	steam	.. 141,404	1,850	182,224
Under construction	hydro	.. 499,039	2,779	63,014
	steam	.. 161,722	3,125	23,980

Tokyo Telephone Extensions

TELEPHONE subscribers in Tokyo whose instruments represent investments of from Y.1,500 to Y.2,000 need fear no break in the market for two or three years at least, it was stated at the department of communications says the Japan Advirtiser. The recent announcement of an order being sent to England for a quantity of new instruments had raised hopes that the capital of Japan some day might boast an adequate telephone system. The officials in the telephone bureau, however, declare that day remains far in the future.

The order placed with an English company for automatic telephones was for only 24,000 instruments, which will be sufficient merely to restore the Tokyo system to its pre-earthquake basis. The number of subscribers in the capital before the fire was 84,000, and even this number will not be restored until another year and a half has passed.

Approximately 40,000 telephones are in use in the city now and the department of Communications expects to have the number increased to 64,000 by March 31, next year. The new automatic telephones will be installed after that.

While admitting that many thousand more subscribers could be obtained if the telephone system were adequate to accommodate them, the officials in charge state that this fact has nothing to do with the question of increasing the facilities. The insurmountable obstacle is the Diet's unwillingness to approve the appropriation of funds necessary to expand the present system. The telephone business, far from returning a profit to the Government, is a source of loss every year and, as conducted at present, there would be no possibility of recovering the cost of installation from subscribers' fees. This situation exists despite the fact that a basis charge of Y.40 a year is made for each telephone and each call is charged at three sen. A larger system and a greater number of subscribers would mean merely a greater deficit, which the government in its present circumstances feels would be an unjustified burden.

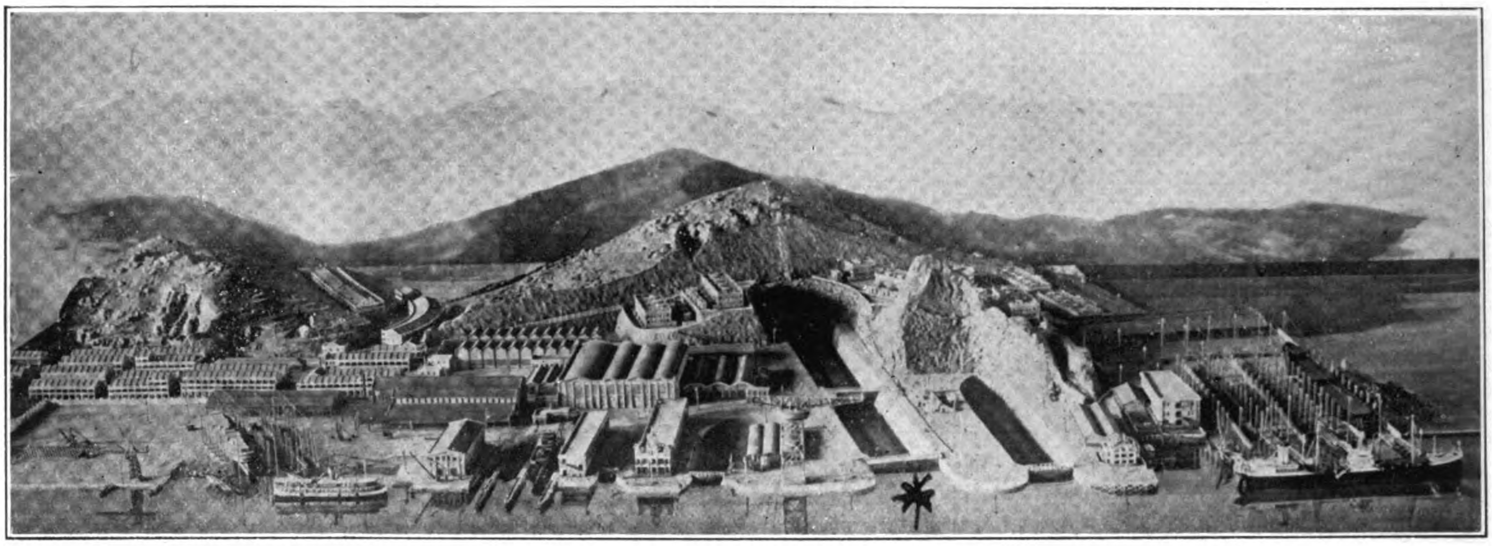
Brokers' Prospects Good.

For several years more, then, the telephone brokers will thrive on the misfortunes of companies to whom the telephone is an essential part of business equipment.

Arnhold Bros., Win Contract

ACCORDING to a Mukden dispatch, there has been considerable heartburning over the recent awards for railway tenders which were put out some months ago. Among other things, bids were asked for machinery for the Koupangtze workshops and twenty miles of rails for a branch railway running to a promising coal mine near Chingchow. Parenthetically it may be remarked that the building of this railway will make the Hulutao harbor scheme essential for the export of coal which cannot be all consumed locally. The feature of the awards has been the overwhelming victory of Belgian steel which has under-cut even American steel so badly that it had not a look-in. Messrs. Arnhold Bros., representing British manufacturers as well as Belgian, took the cream of the contracts on Belgian accounts as no other prices were competing except some British power plant prices.

The Jardine Engineering Corporation secured the sleeper contract in a last minute tender, everything going to show that the Manchurian authorities have had the utmost value for their money ; contractors having to work at very fine rates indeed to have a chance. The strong position of the Belgian manufacturers is ascribed to the fact that iron ore and coking coal are alongside the works and that every known automatic device has been put in since the war with government help making the Belgian position impregnable. Meanwhile the high power cable-cars give promise of being in operation here before they are in Peking. The rails have all arrived and the German contractors are pushing on with their work as fast as possible.



New Graving Dock, 1,200 Feet Long, to be Largest in World, having Double Efficiency due to its Division into Two Units, if Need be, to Dock Small Craft

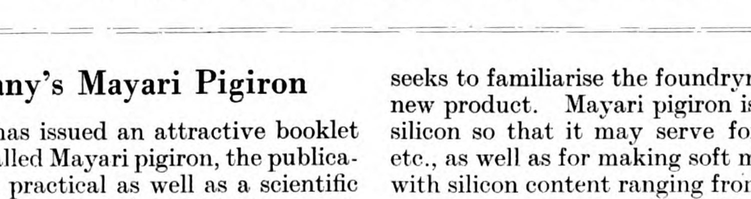
Hongkong and Whampoa Dock Exhibits Model at Wembley*

ONE of the most admired features of the Hongkong exhibit at the British exhibition at Wembley was a model showing the various component parts of the Hongkong and Whampoa Dock which is reputed to contain the largest graving dock in the world. This was especially interesting to the British public in proving than even were the Singapore naval base scheme to come to naught, the Empire still would have a dock in the Far East capable of taking the largest battleship afloat not only for minor repairs but major ones as well. This new dock at the Kowloon plant of the company is 1,200 feet long with a minimum breadth of 128 feet, large enough to take the biggest liner or the most powerful battleship afloat.

The dock is not designed only for the leviathans of the sea, but is arranged for docking much smaller vessels in case no large applicant appears in the offing. This is accomplished by a division lock which virtually cuts the huge graving dock in two, giving an inner dock of 710 feet for the larger vessels that ply the Far Eastern seas, with an outer dock of 470 feet in length for the smaller fry, and few of the China coasters exceed this length. With this graving dock in full operation as it soon will be, the ship repairing facilities of the Hongkong and Whampoa Dock Company will be almost doubled and make it the premier installation in the Far East for docking any steamer that may require such service in the next ten years.

The plant of the Hongkong and Whampoa Dock Co., Ltd., is the growth of some 60 years of endeavor and the policy of the company always has been to keep its facilities ahead of the maximum possible requirements. To this end the dock is expending no less than $5,000,000 to prepare for any future call upon its resources. Aside from the huge graving dock, the company operates three smaller docks, the largest of which can take ships up to 700 feet in length and two slipways with a maximum length for No. 1 of 650 feet, together with the Cosmopolitan dock, and the Aberdeen docks on the Island of Hongkong, comprising the Hope and Lamont docks.

In the design of these docks, the greatest possible efficiency is attained by adequate pumping equipment which has been greatly augmented to meet the requirements of the new graving dock. The apparatus now installed is expected to empty it in some three and one-half hours. The pumps are operated by 2,200 volt, 3 phase, 60 cycle motors of 550 h.p. for each of the five 42 inch twin parallel type centrifugal pumps. Other entities of the dock's equipment are on like scale and no effort has been spared to be prepared for any emergency in building or repair of ships, so that machine shops, foundries, boiler shops and wood working installations are along the most modern lines. During its 60 years of experience and growth, the Hongkong and Whampoa Dock Co., Ltd., has solved many problems of ship repair and construction, the latest of its launchings being the steamer Lienshing, built to the order of the Indo-China Steam Navigation Company, Ltd., for the Shanghai-Tientsin run.



S.S. Lienshing, Built by Hongkong and Whampoa Dock Co., Ltd.

*Full description of the Hongkong and Whampoa Dock Co., Ltd., will be found on page 233 of the May, 1924 issue of THE FAR EASTERN REVIEW.

Bethlehem Steel Company's Mayari Pigiron

THE Bethlehem Steel Company has issued an attractive booklet on its nickel chromium iron called Mayari pigiron, the publication being noteworthy from a practical as well as a scientific standpoint. It embodies the work of Dr. Richard Moldenke on this particular alloy iron as reported by him to the American Institute of mining and metallurgical engineers on the scientific side. It also seeks to familiarise the foundryman with the details of working this new product. Mayari pigiron is made with a considerable range of silicon so that it may serve for white iron castings, chilled rolls, etc., as well as for making soft machineable castings. It is supplied with silicon content ranging from a quarter of one per cent., to more than two per cent., while nickel runs from 80 points to 1.25 per cent., and chromium from 1.60 to 2.50 per cent. Phosphorus is kept below ten points and sulphur below five as a maximum.

The British Empire Exhibition

Eleven Acres Devoted to Engineering

THE British empire exhibition recently inaugurated and opened at Wembley Park, London, by King George, to remain open for six months, perhaps longer, is of the utmost importance to the engineering world. Before reviewing the main features of the engineering section, in order to give readers some idea of the vastness of the exhibition, a few general details will be of interest.

The total area covered is 240 acres, the buildings and exhibits costing over 120 million dollars, while it is confidently anticipated that a further $100,000,000 will be spent by the thirty million visitors who, it is conservatively estimated, will attend this exhibition (during the first few days after opening, when not by any means in running order, it attracted a steady 100,000 daily). Five railways run into the grounds and 15 miles of roads traverse the exhibition. The world's largest stadium with seating accommodation for 125,000 spectators, takes up one corner of the grounds. In its construction 1,500,000 rivets have been used. The largest bandstand has an enclosure of 10,000 seats, 3,000 more being available outside. The amusement park which covers

Palace of Engineering at the British Empire Exhibition Covering an Area of over Eleven Acres

British Empire Exhibition—Portion of the Electrical Section in the Palace of Engineering

46 acres, has a theatre and dance hall said to be twice the size of any other in existence. Over two million lights are used for illuminating purposes, and 54 restaurants—all under one management—cater for the needs of the inner man.

The two largest buildings are known as the palace of engineering and the palace of industry. The former covers an area of 596,000 sq. ft. and houses over 11 acres of solid machinery exhibits. It is the largest ferro-concrete building in the world and in it are five railway bays for the transhipment of exhibits directly to and from their beds. The floor of this building is concreted to a depth of four inches at a cost of $100,000.

Engineering being the premier industry of this country, the design of the palace of engineering has been carried out with the idea of its being a monument worthy of the craft. This ambitious plan has fully developed, with the result that under one roof is shown every example of the skill of the country's engineers.

In order to avoid confusion, the engineering exhibits have been divided into three main sections—general engineering, electrical engineering and transport. In all these sections, which cover the entire field, there is gathered together the most representative display of engineering products the world has yet seen. The exhibits range from some weighing over 150 tons each down to the most delicate testing intruments that have ever been produced.

The general engineering section, which has been organized by the British engineers' association, and which occupies nearly half of the huge building, shows every phase of the craft from the molten metal stage to the finished machine, tool, or engine. More than four hundred firms are exhibiting in this section. Foundry practice is represented by small cupolas heated by gas and coke, by moulding machines and other appliances employed in the smelting and casting of metals. Structural engineering is illustrated in a wide range of activities, together with the operation of pneumatic tools. Huge forgings, castings, and stampings reveal the class of work that is undertaken in the modern engineering shop, while groups of machine tools demonstrate how the rough materials from the foundry, the steam hammer, the hydraulic press, and the smith are turned, faced, drilled, and shaped into some part of a complicated machine.

In each bay of the palace there is a huge overhead electric traveling crane, capable of lifting 25-ton loads. Jib cranes, locomotive cranes, hoists, and other lifting gear are represented in great variety, as well as types of mechanical excavators and steam shovels. Coal has its proper and prominent place. There is a complete show of colliery equipment, including winding-engines, coal-cutters, pit props of steel and wood, tubs for conveying coal from the working face, pumps, ventilating fans, and every form of machine used in a modern coal mine. Additional to this exposition, although out of the palace of engineering, there is a full-sized model colliery, with a shaft down which visitors are taken, leading to underground workings in which electric coal cutters are shown at work, pumps running to keep the workings clear of water, fans for supplying fresh air, tubs filled with coal and running on a miniature railway with pit ponies to pull them. Above ground is shown the huge pit-head gear and winding engine for bringing the coal to the surface, washing and screening machines, life-saving apparatus, and medical appliances for emergency use. The cost of constructing this mine alone approximated half a million dollars.

One of the most striking displays in the palace of engineering takes the form of the deck, bridge, and upper works of a modern passenger steamship, showing the intricate mechanism that controls the mass of machinery needed for the vessel's propulsion, for illumination, heat and ventilation, operation of elevators, pumps, capstans, etc., for the maintenance of wireless communication, and for ensuring the safety of the passengers and crew.

There is a life-like representation of divers at work under water. These men wear the latest types of dress and helmet and are equipped with telephones which permit of their holding a conversation with the men many fathoms above them on the salvage vessel.

British Empire Exhibition—An End of One of the Thirteen Huge Avenues which Compose the Palace of Industry, the Largest Ferro-Concrete Building in the World

The great engines of modern ocean liners are exhibited in this section along with some of the most modern and up-to-date boilers using oil for fuel. Boilers of all patterns from the well-tried Lancashire type to the latest form of water tubes, super-heater, and mechanical stoker are represented. Some of these are opened out in order that their construction may be examined, while others are used in the power house and elsewhere. Marine engines, of Diesel and semi-Diesel type, and steam turbines are exhibited in a wealth of variety and power, together with all forms of ship-control apparatus. Every type of machine tool is shown and modern methods of handling goods are illustrated in conveyors, transporters, elevators, cranes, steam shovels and grabs. Agricultural machinery and implements are demonstrated by leading manufacturers, and textile machinery includes the most up-to-date looms.

As the body responsible for this section, the British engineers, association has made its display complete by the inclusion of facilities for the reception of overseas visitors. A special staff is in attendance in the B.E.A. bureau to answer inquiries concerning the trade and the exhibits. Interpreters, technical engineers, and messengers are available, and every effort is made to make the visitors comfortable.

The science of engineering as applied to military purposes is represented by actual specimens of big armor-piercing shells and the guns that fire them, by pieces of 14-inch armor-plate used to protect battleships from gunfire. Howitzers, field guns, anti-aircraft guns, and searchlight equipments also have a place in this wonderful demonstration. Probably the most notable military exhibits are the enormous 16-inch naval gun, the breech mechanism of which is shown in operation, and the vast array of aircraft. The naval interest is also contributed by large scale models of battleships, destroyers and submarines, the information which they present being added to by life-size sections.

The research section is provided by the national physical laboratory and includes departments devoted to physics, metrology, engineering, metallurgy, and the William Froude national tank. The physics department shows in operation a modern electric furnace with its high temperature pyrometer, and conducts X-ray examinations into industrial materials in search for faulty workmanship and to illustrate the atomic structure of pure metals, alloys, and compounds. Hygrometers, of various types, for investigating humidities are displayed, together with a special arc furnace used for highly important research work on arcs at high pressure. An instrument which shows the finest thread as large as a ship's cable is shown in the metrology department, which covers all methods of measuring.

The engineering department presents machines for testing the strength and efficiency of chains, gears, and bearings, and a Wohler fatigue-testing machine, which, aided by its small mirror, indicates when a metal has reached the limit of its endurance. Examples of castings, wrought alloys, test pieces, forgings, and special alloys are shown to illustrate the effects of heat treatment and their resistance to fatigue ; investigatory methods are described and typical failures shown in the metallurgy department, which also includes many interesting specimens demonstrating the behavior of mild steel under cutting tools. Electric furnace controls are displayed in operation.

A wax model of a ship as employed for tests draws attention to the William Froude national tank, which predicts the resistance of given forms of ships, the power necessary to propel them, and any other of their qualities on which information is desired. Altogether the national physical laboratory's exhibit is a wonder-provoking demonstration of the amount of research and mathematical precision which lies hidden behind the finished products of the engineering industry.

The electrical engineering section occupies a floor space of about 3½ acres in the palace. It presents a striking demonstration of the way in which electricity has come into use in every phase of industrial and domestic life. The development in electrical engineering has been rapid and continuous, and in this section can be seen the latest achievements in turbo-alternator design, in switchgear, transformers, storage batteries and plant used in connection with the generation, conservation, and distribution of electrical energy on an enormous scale. The practical application of electricity for the purposes of the British empire exhibition is shown. On the north side of the section is a completely equipped boiler house and power station of 6,000 h.p., together with a sub-station. In the boiler house is shown how the coal is handled mechanically and conveyed to a large bunker on the roof of the building. From here it passes to the boilers, which are stoked mechanically, and measuring appliances are installed by which the attendant can see the amount of coal which is being used, the temperatures at various parts of the boiler, and the amount of steam which is being supplied to the power station. He can thus tell at a glance all that is happening in the boiler house.

In the power station by the side of the boiler house are installed three steam turbines with direct coupled generators, and below this are fixed the condensers by which the steam, after being used in the turbines, is condensed and conveyed to the boiler to be used again. Along one side of the power station is fixed a switchboard through which the electrical energy is supplied to the entire exhibition. The energy supplied from the switchboard not being of the right voltage for most purposes of the exhibition, sub-stations and transformer stations are installed in various parts of the grounds. One of the most interesting of these sub-stations—near the power station itself—is arranged for converting alternating current as supplied by the generators to direct current, largely for use in the great amusement park.

Among the larger applications of electric power those of particular interest are the electric appliances for the driving of trains and tramways and those for factory use. All these are well represented. There are exhibits of railway motors and control gear, and of large railway coaches electrically equipped such as those used in the traffic systems of large cities.

In order to show the many examples of the usefulness of electricity in the home, an entirely novel " electric house " has been constructed and is so arranged as to permit large crowds to view at leisure and in comfort all the usual and practical applications of electricity for domestic use. A restful " Electric Rendezvous," where one can obtain any information desired concerning electrical facilities in the districts in which they reside, and find accommodation for rest or arrange meetings with friends, is at the service of all interested in electricity.

In addition, in another pavilion there is arranged an exhibit showing the use of electricity in agriculture, farm and dairy work, showing electrical haymaking without sunshine, electric milkers, and numerous other exhibits of special interest to farmers.

The transport section, as an important branch of the engineering industry, has a large proportion of the palace of engineering in which to display the wonders of the progress which has been made since the early days of horse and wind propulsion. The section is subdivided into four subsidiary sections—railway transport, land transport, sea transport, and motor transport.

In the railway sub-section, the famous railways of the country display their latest achievements, and associated with them are the prominent makers of rolling stock and other railway and tramway appliances. The whole of railway history is summed up in one corner of the section, where, side by side, are shown a modern express engine weighing 150 tons, costing $70,000, and the first steam engine to run over any railroad. The latter is called locomotion No. 1, and was built by Robert Stevenson. It *preceded* the famous Rocket and made its first journey over the Stockton & Darlington line at a speed of eight miles an hour. The engine weighs six and a half tons and is in a remarkable state of preservation. The modern express engine was brought all the way from Doncaster (140 miles distant) to its resting place in the exposition without once leaving the metals.

Additional to the motive power of the trains are actual examples of the latest types of passenger coaches, dining cars, and freight wagons. Some of these are built entirely of steel to eliminate the fire danger, the steelwork being disguised to resemble painted woodwork. Modern pullman coaches and up-to-date signalling methods help to complete the railway display, while any features which cannot be displayed are shown in a commodious special picture theatre. The general land and factory sub-section contains a display by well-known firms of carriers and also exhibits relating to factory equipment and communication.

The exhibits of the water transport sub-section are contributed by leading steamship companies and associations connected with various important shipping ports. The White Star line are showing models of two of their most famous liners, the *Majestic*, said to be the largest steamer in the world, and the *Homeric*, the largest twin-screw steamer in the world. The R.M.S.P. Co. are exhibiting several large models of their vessels, including the *Arcadian*, the largest steamer in the world devoted solely to

pleasure cruising, and a huge case containing water-line models showing the history of the company's ships from its inauguration to the present day. Side by side with the *Forth*, of 1,900 tons, launched in 1841, is the *Ohio*, the company's largest vessel, of 19,000 tons.

The ports of the United Kingdom are represented by exhibits from the port of London authority and the Mersey (Liverpool) docks and harbors board. Designed by Sir Edward Lutyens, the noted architect responsible for the new port of London authority building (just erected at a cost of $22,500,000 and said to be the finest building in London), the stand which houses the authority's exhibits is in keeping with the magnificent parent building. It consists of two halls, the exhibition hall and the movie hall. In the former is shown a valuable and unique collection of old prints and paintings depicting the life associated with the port of London in the 17th, 18th and 19th centuries. On the floor of the hall are models of London's largest and most modern docks. Statistics of the tremendous volume of traffic and merchandise handled through these docks are shown on the largest multiplex signs in the country. In the movie hall is shown a 3,000-foot film depicting every phase of waterfront activity.

Liverpool, as the port handling the greatest export trade of any English port, has made a very interesting addition to the exhibition by a working model to scale of the port of Liverpool, illustrating the immense facilities offered to the shipper by the 37 miles of quays of the Mersey port.

Perhaps one of the most interesting of the transport sections is that of motor transport. Here are shown the latest examples of pleasure and commercial vehicles, representing the best that efficient craftmanship and design can produce. Steam road rollers, motor rollers, traction engines, agricultural and other tractors—all these are here. All exhibitors in this section have been strictly rationed as to space in order to insure that it is thoroughly representative of the whole industry. Rarely is more than one model of any make on view, but exhibitors are permitted to change their exhibit monthly. This is an entirely new feature of automobile displays which will undoubtedly be much considered by organizers of future fairs. The motor and cycle section illustrates every application of the gas motor, aero engine, motor truck, steam, electric, and gasoline vehicles, tires, accessories, and auto bodywork. The products of some 200 manufacturers are represented.

It is impossible to enumerate all that this section of transport displays, but the founders of the exhibition have one principal aim—the capture of foreign trade. The display covers an area of 50,000 square feet.

The ambitious plan of the organizers of the palace of engineering to show every branch of the industry under one roof has surely been achieved, and the founders, as well as the eight hundred exhibitors, have every reason to be proud of the result. It is as they intended it should be—the most complete and comprehensive exposition of the engineering industry ever assembled under one roof.

Parson's Turbine Exhibit at Wembley

AMONGST the many and wonderful exhibits to be seen at the empire exhibition at Wembley, perhaps one of the most interesting is that of Messrs. C. A. Parsons & Co., Ltd.

The first steam turbine which was of any practical use was constructed by the Hon. Sir Charles A. Parsons at Gateshead-on-Tyne in the year 1884, and some idea of the remarkable strides which have been made in turbine design and construction since those early days, can be obtained by a visit to their stand at the exhibition.

The principal exhibit is a 12,000 k.w. 3,000 r.p.m. tandem turbo-alternator and exciter, designed for railway traction. (The plant is one of the five sets with surface condensers constructed during 1923-24 for the Union of South Africa electricity supply commission. These sets will be erected in the new power station at Colenso, Natal, for the electrification of the railway between Glencoe and Pietermaritsburg. Each set is capable of supporting an overload momentarily of 20,000 k.w. and is similar in design to the 15,000 k.w. 3,000 r.p.m. plants recently exported by the Parsons Company to the Victoria electricity commission, Australia, for the electrification of the Melbourne Suburban Railways).

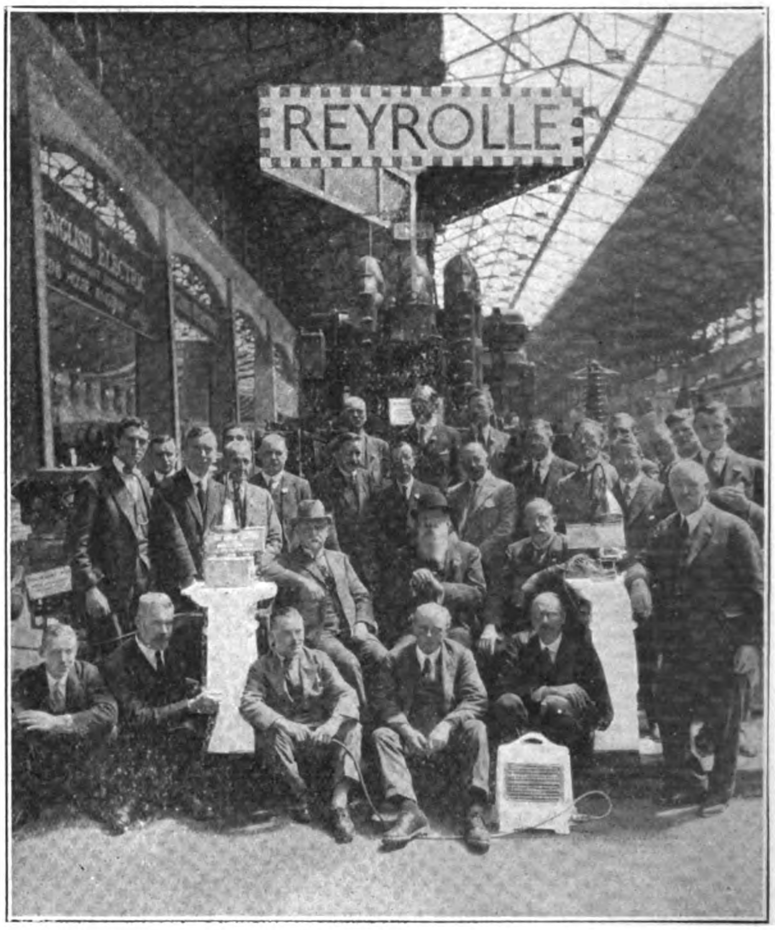
Another exhibit of special interest is a $\frac{1}{12}$ scale model of a 50,000 k.w. turbo-alternator and condensing plant which is now nearing completion at Heaton Works, and will be erected in the new 500,000 k.w. station at Crawford Avenue, Chicago, To show the layout of the plant in relation to the engine room, the model includes basement, walls, roof and crane. Some idea of the immensity of the station will be gained from the fact that the crane-rail span is 122-ft., and the height from basement to the apex of the roof is 113 feet. The model is 9-ft. 5-in. high, 7-ft. 10-in. wide and 11-ft. 3-in. long This plant is the second set exported by the Parsons Company to Chicago, a 25,000 k.w. tandem turbo-alternator having been erected in the " Fisk Street Station " in 1913. Messrs. G. & J. Weir supplied the models of the boiler—and condensing plant—auxiliaries, which they are manufacturing.

A second model—also to $\frac{1}{12}$ scale should prove of interest to mill owners. It shows a geared turbine power installation in a Lancashire cotton mill. The actual plant from which the model was made has been in operation for over ten years.

Of considerable historical interest is another exhibit which is a small $\frac{1}{2}$ kilowatt ($\frac{2}{3}$ horse power) direct coupled turbo-dynamo, running under steam at about 9,000 r.p.m. It was built some thirty years ago, and is of similar type to the first Parsons machine of 1884 which now rests in the museum of science and technology at South Kensington. The turbine is arranged on the double flow principle ; and the speed is regulated by a combined mechanically and electrically operated governing mechanism of great ingenuity.

Engineering Press at Wembley

ENGINEERING Press representatives at the armour-clad Switchgear Exhibit of Messrs. A. Reyrolle & Co., Ltd., Palace of Engineering, Wembley Exhibition, Friday, May 30. A description of the gear will appear in an early issue.

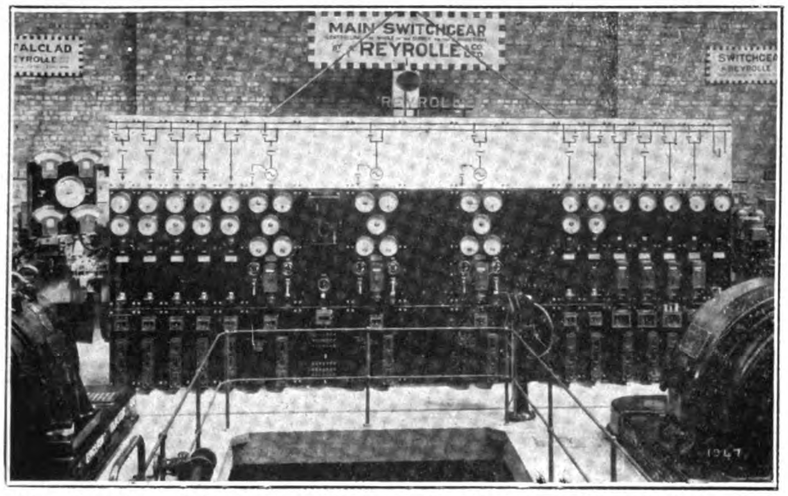


Reyrolle in Control

Metal Clad Switchgear at British Empire Exhibition

The design of the power station, which is situated in a bay of the Palace of Engineering and supplies the whole of the British Empire Exhibition, has been given much careful eonsideration in order that when complete it should be typical of first class British practice. The resulting installation has amply fulfilled the aims of the engineers. The general impression obtained is of a compact design, readily accessible and with all the essential apparatus and control equipment easily visible to the operating Engineer. This is no less the case with the main switchboard than with the turbo alternators themselves. As an example of up-to-date British practice it is a particularly happy choice on the part of those responsible for the design of the power station.

The present tendency in power station design is undoubtedly towards increased reliability and the safety of the operators and the metalclad designs typify this in their fullest sense. The principle of metalcladding is not a new one; it originated in the year 1908 and was immediately adopted by Messrs. A. Reyrolle & Co., Ltd., as the basic principle of safe switchgear design upon which they pioneered their now universally known metalclad switchgear. This design was very early appreciated and extensively used by the large power supply authorities who recognised at once its effect in simplifying and cheapening substation design, while effecting a still greater improvement in the safety of the whole system.



Wembley Power Station Control Board Supplied by A Reyrolle & Co., Ltd.

The Exhibition power station switchboard comprises fifteen panels with a normal rupturing capacity of 250,000 K.V.A. It is arranged along a wall on a turbine floor in full view of the public gallery. It is electrically operated from a control board placed a few feet in front of it and the whole arrangement is one of outstanding robustness and simplicity, the complete accessibility and the small space occupied being particularly noticeable. The system of supply is 3 phase, 3,000 volts, 50 cycles per second and the circuits controlled are:—

Three 1,500 K.W. turbo alternators with full metering, synchronising and indicating equipment, Merz-Price discriminating fault protection and field suppression and neutral earthing devices; Two 500 K.W. rotary converter, and four 500/1,000 K.V.A. transformer panels with inverse time limit overload protection; Four outgoing feeders with definite time limit overload protection; One incoming feeder with inverse time limit overload protection; One busbar coupling panel.

There is no special masonry construction whatever and any portion of the complete metalclad board could be touched by the general public or a contingent from an infant school, without damage to themselves. An automatic diagram above the main control board indicates the operation of every panel in detail, all indicators being electrically operated by auxiliary switches on the switch panels.

The robust construction and neatness of finish and assembly of this switchgear is typical of Messrs A. Reyrolle & Co., Ltd.'s standard productions and is reflected throughout the exhibits on their Stand and also on the control equipment for the "Peebles-Reyrolle Automatic Service" exhibit on Messrs. Peebles Stand, which they also designed and manufactured.

The Edgar Allen & Co., Ltd.

Comprehensive Exhibit at Wembley

ONE of the most comprehensive exhibits at the British Empire Exhibition at Wembley is that of the Edgar Allen & Co., Ltd., as it exemplifies to a great degree the slogan of the firm "the right steel for every tool," the phrase which greets every visitor to the stand. The exhibits while many in number are arranged to good advantage considering that they include several items of mining machinery, the portable stag ore crusher with its revolving screen, and, the heavy stag crushing rolls being especially interesting to mine operators. The exhibit also includes the stag ball mill with its perforated chrome steel grinding plates that deliver the material ground to any degree of fineness through intermediate and outer screens into the tapered bottom of the outer casing of the mill.

Another machine of interest is the stag pulverizing cylinder for batch grinding of ores or minerals in either the wet or dry state. This type of mill is lined with steel and the grinding material is either small steel balls, special flint pebbles or porcelain balls depending upon the character of material to be treated. Nearby is a full sized model of the Imperial automatic measurer used for the rapid measurement of coal, sand, lime and other materials. This machine has rotary valves at top and bottom so arranged that when the top one is opened the bottom is closed then when the measuring chamber of which there are two, is filled, the bottom valve opens, discharging the material from one chamber while the other is filling.

Something like 100 kinds of materials that have been crushed by the machines on exhibition are shown, ranging in hardness from charcoal to hard chrome iron ore.

The Edgar Allen railway department is of great interest as it includes some switches made of the celebrated manganese steel that while it is so ductile it can be bent cold without fear of breaking and so hard that no tool has been found that will machine them. All shaping has to be done with intricate grinding machines. As it was manifestly impossible to show the completed track work in the limited space, special photographs were taken to exemplify some of the more intricate of the company's special installations. Others are shown by reproduction of the original drawings.

It would take much greater space than is at our disposal barely to enumerate the other exhibits of the Edgar Allen Company. Steel for tools in every grade from the high-speed kind that will cut when red hot to the slower type steels that take huge shavings off cast iron. Among the more remarkable saws exhibited, is one without teeth. It is 46 inches in diameter and finished with a chisel face. It operates as a friction disc and eats its way through the metal by revolving at a speed of 25,000 feet a minute. Other saws to cut almost every variety of material, including one for hot metal, are shown. Nor are the later, alloy steels omitted, since the motorcar steel department has nickel steel, chrome-vanadium and nickel—chrome steels especially designed for the heavy stresses of modern motor vehicles.

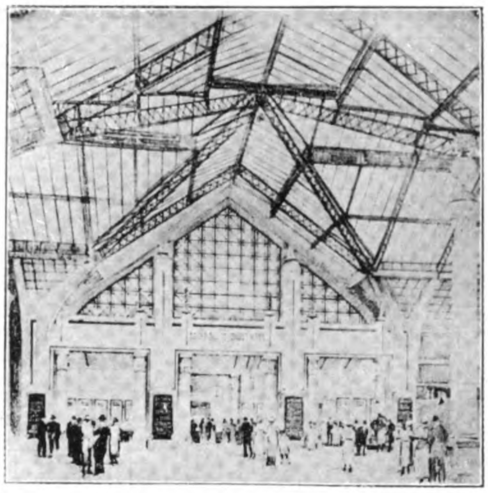
Intricate steel castings and products of the forge and press department are also included in such variety that one marvels at the ingenuity of the foundrymen. One of these is a cast steel disc for an oil-cake cutter which is remarkable for its diamond shaped teeth each of which must have a perfectly sharp point. Unless the points of the 52 teeth are like needles, the whole casting is wasted. Hot steel and an infinite attention to moulding details bring about the desired result, which, however, was not easily attained even by the firm's skilled foundrymen. Cast steel crankshafts also are shown as beautiful specimens of the skill of the foundry but Messrs. Edgar Allen and Co., recommend rather that only forged and not cast crankshafts should be used.

Taken all in all, the exhibit is one that illuminates not only the varied uses of "Stag" brand steel, but the almost limitless variety of the materials and the thousand-and-one applications that can be made of this firm's product. It is also a liberal education in the advancement in the use of steel that has come about since the day, only a few years ago, when "high-carbon" and "low-carbon" were about the only varieties available for the selective genius of the engineer who now can choose "the right steel for every tool" from the products of the Edgar Allen & Co., Ltd.

Nobel Industries Limited at Wembley

Its Influence in Commerce Reconstruction Work the Effect on Every-day Life

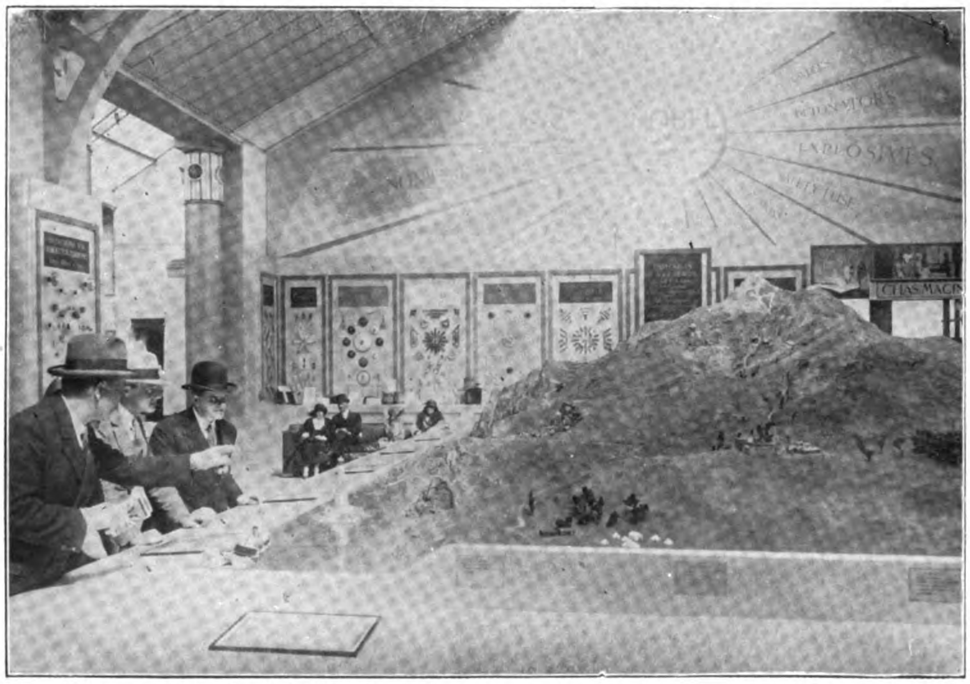
NOBEL Industries, Limited was formed in 1918 by the amalgamation of British manufacturers of explosives and accessories, ammunition, metals, and allied industries, and have published a guide book designed to afford an insight into their exhibit —the Nobel bay—in section "E" of the palace of industry at the British empire exhibition. The following is a summary:



The Nobel Pavilion

The exhibit embraces numerous types of explosives and gun-powders used for industrial purposes; propellent and disruptive explosives, brass cartridge cases, fuzes for shells, small arm ammunition, sporting cartridges, metal products in a raw and in a semi-manufactured condition, with examples of the physical tests imposed on them; nails, gas mantles, lamps, new collodion products in the form of paints and varnishes, Sunbeam motor bicycles and ordinary bicycles, radiators, carburettors, motor accessories, welding plant, leather cloth for all kinds of upholstery purposes, and many applications of the famous lightning fastener. Samples of the fertilizers produced at factories in South Africa and Australia, such as are used in large quantities for agricultural purposes in those countries, as well as a variety of chemical products, are also included.

There is a popular fallacy that the explosives industry is dependent upon war for its prosperity, whereas the manufacture of explosives for industrial purposes at a low price is one of the fundamental necessities of modern progress: factories for the production of industrial explosives form the nucleus for the manufacture of munitions of war in a national emergency, and this represents the true relation of the industry to war-like purposes.



The model in the Nobel bay has been made to illustrate the influence of Nobel Industries Limited. It consists of a piece of country on which are situated collieries, quarries, public works, etc., to illustrate the application of blasting explosives; the railway, the application of leather cloth, electric welding, incandescent mantles, non-ferrous metals; the tramways, Thermit welding; the motor cars, John Marston and excelsior radiators and Rotax Lighting; the bicycle shop, "Sunbeam" bicycles and motor bicycles; the boot shop, Necol products. Ammunition and propellent explosives are suggested by the fort. The tents have the lightning fastener. The lighthouse uses gas mantles and sound signals. The wreck suggests Tonite explosive. On the shooting estates, Eley and Kynoch shot-gun cartridges are used.

The importance of explosives in the development of industry will be appreciated from the fact that in winning coal and metal ores from the mines of the empire, 50,000 tons of explosives, with the requisite blasting accessories—detonators, safety fuse, etc. —manufactured by Nobel associated companies—are used annually.

Mining does not exhaust the industrial application of explosives; their destructive properties for constructive purposes have been adequately represented in engineering projects, such as cutting tunnels, building roads and railways and removing obstructions to navigation. These and similar uses are illustrated by typical examples in the form of a model landscape in the Nobel bay, which it is expected will convey to the minds of visitors a better idea of the Nobel organization than a mere review of their products could possibly accomplish.

Nobel products contribute in a larger measure than is generally appreciated to the sum of commodities necessary for modern conditions of life; semi-manufactured goods of non-ferrous metal, such as brass and copper rods, wire, hollow brass and copper ware, brass fittings of all sorts, collodion products, leather cloth and other commodities in the exhibit illustrate this point. Nobel's also own and operate a mint, and are, therefore, equipped to execute coinage contracts for overseas governments.

Visitors will observe the relationship between the metal and the explosives sections of this undertaking—especially in the apparently insignificant, but really important, detonator—and also in sporting cartridges for shot-guns, rifles, revolvers and containers of greater calibre or explosives charges.

Analytical, research and metallurgical chemists, mechanical and chemical engineers and other specially trained experts collaborate continuously in the development of the manufacture of these highly technical products; thus constant attention to the improvement of the quality of existing products, and to the development of new commodities, has led to the name Nobel being recognized as the standard of quality throughout the world for the commodities with which it is identified.

The advent of the British empire exhibition has afforded an opportunity of presenting in concrete form particulars of the products of the associated companies of Nobel industries in one composite exhibit, and arrangements have been made to present visitors with a specially designed medal minted in the coining press in the Nobel bay in commemoration of this event.

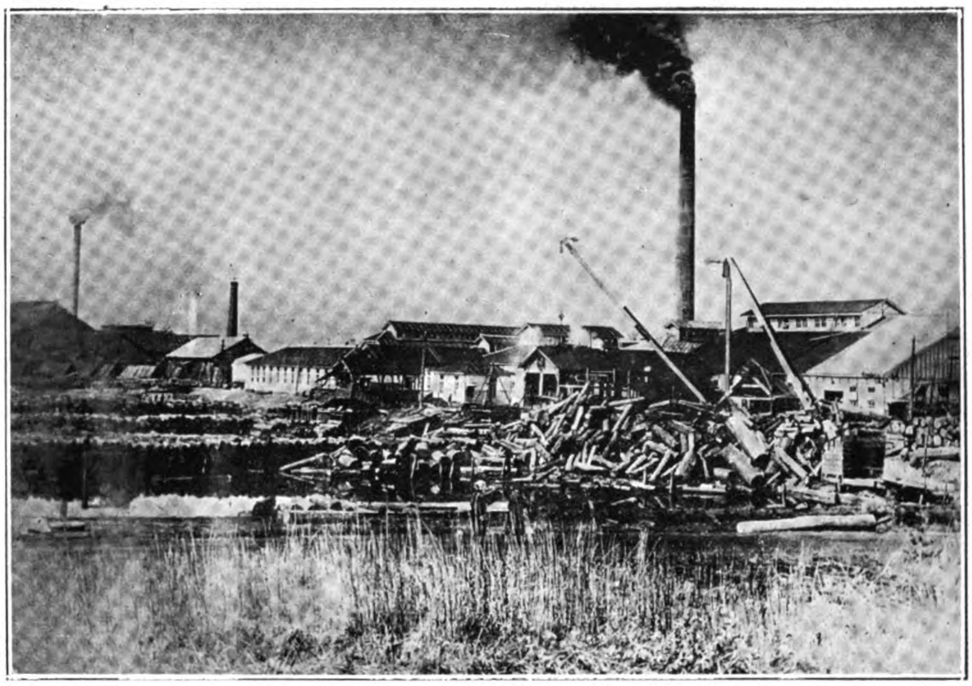
The Veneer Industry of Japan

By Eisaburo Kusano

WHEN Rome was in at the height of its ancient prosperity, Roman furniture makers are recorded to have gone to Greece for beautiful and precious Oriental woods with which to manufacture inlaid tables and ceilings. But it was not until some 30 years ago, that the veneer manufacturing industry really began to show progress. The modern increase in the demand for high class furniture, and the steady decrease in the veneer trees usually of mountain growth have stimulated the veneer industry to remarkable development.

Primarily, only rare varieties of trees were made into veneer. In recent years, however, ordinary trees such as maple, oak, and ash are also being used, mainly because of the cheapness of the trees and of their many characteristic advantages.

By the use of veneering machines thin boards of almost any size are easily obtainable. Such a board is almost entirely free from warping, cracking, shrinking, expanding or undergoing any change of form as a result of weather conditions. As several thin sheets can be glued together lengthwise and breadthwise, the flexibility of such an aggregate far exceeds that of thick one piece boards so that the veneer board is considerably lighter, as well as being stronger.



The Nitta Veneer Manufacturing Works, Hokkaido

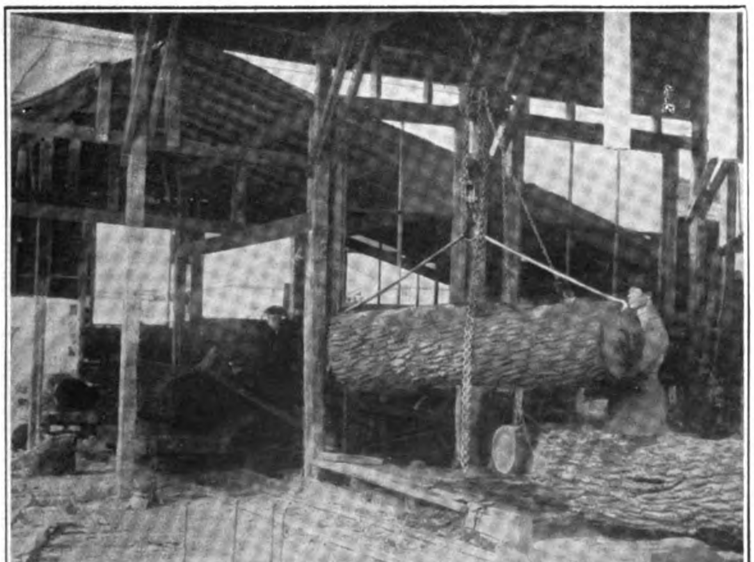
Veneer boards are now used widely in Japan, both in Japanese style construction and foreign houses. They are also used in large amount for manufacturing doors, tables and other furniture, tramcars, railway carriages, steamers, gramophones, toys, automobiles, and aeroplanes. For aeroplanes, birch and cottonwood veneer boards are mostly used, because of their light weight and resistance to change in weather conditions. Although the thickness of boards for this purpose varies in accordance with the part for which the board is used, it ranges from 1 m/m to 10 m/m, but in the main the 1.5 m/m and 3 m/m boards are the standards. The body, walls, ribs, and the beds of engines of Japanese military and naval aeroplanes are almost exclusively built up from veneer boards manufactured by the Nitta Veneer Manufacturing Works Partnership, Japan's greatest plant.

Generally speaking, there are three methods whereby veneer boards are manufactured. They are: Grain veneer boards made by a rotary lathe; quarter veneer boards by a slicing machine and boards by the so-called veneer sawing method.

In rotary lathe cutting the log is dipped in hot water for a while in order to soften the wood. On being taken out of the hot water, the bark is removed, and both ends of the log are cut off by a drag-saw to the required length. The barked log, then, is held by the spindle of the rotary veneer lathe. As the spindle turns, the knife of the lathe, which is set tangent to the log peels the wood in a thin ribbon to the required thickness but it is as wide as the log. By this method, the thickness of the board may be fixed at any point between a gossamer web and ⅜ inches.

This method of slicing is especially used in handling such trees as cryptomeria, paulownia, and mahogany. These trees have beautiful grain effects which are brought out in the quarter-sawed wood. By using a band-saw these woods may be sliced to any thickness between 1/150 inch and ¼ inch.

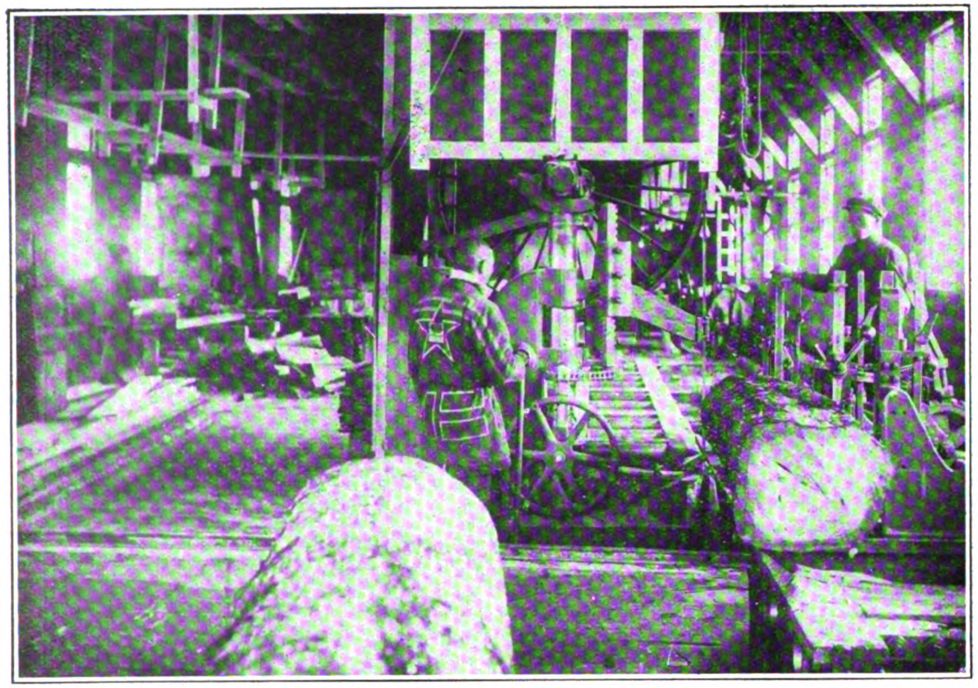
In veneer-sawing a fine quarter-sawing band-saw is used and



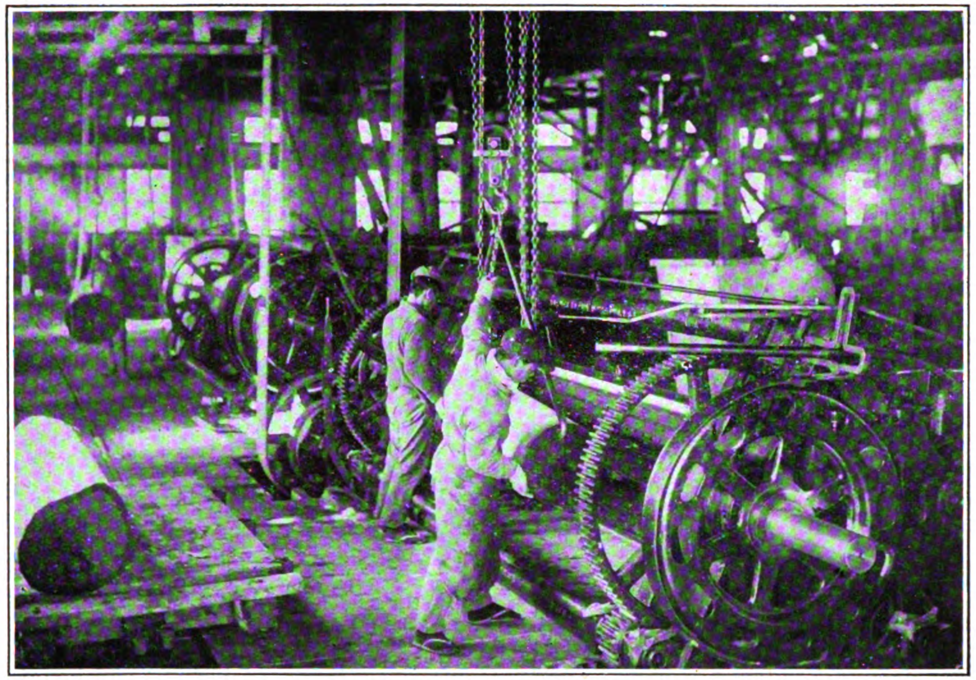
Squaring up the Log

Packing for Export

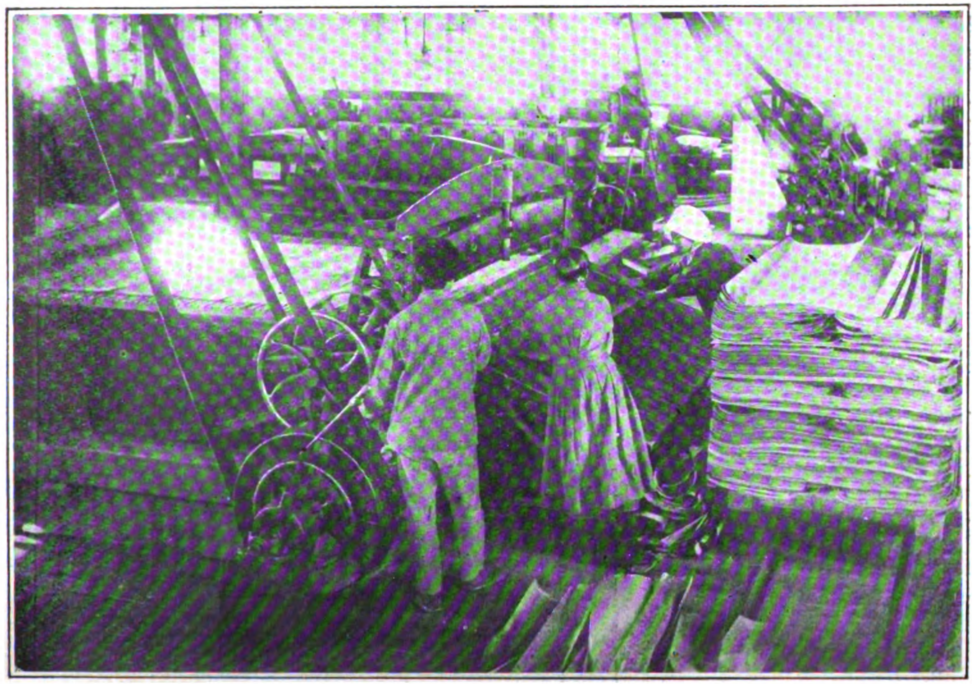
EQUIPMENT OF THE NITTA VENEER WORKS IN HOKKAIDO



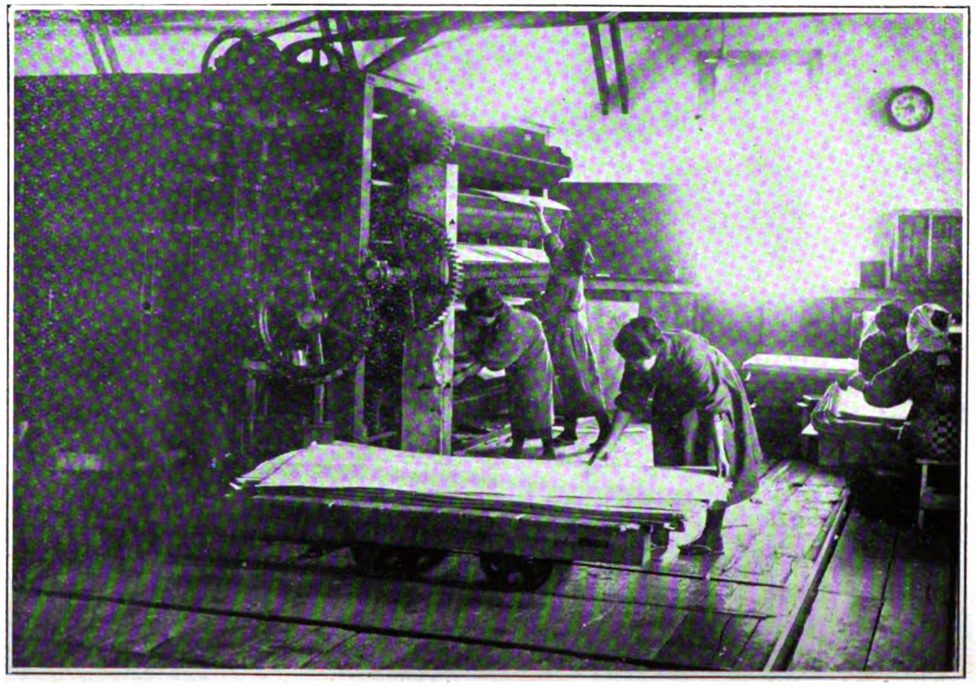
Band Saw to Prepare Logs for Lathe



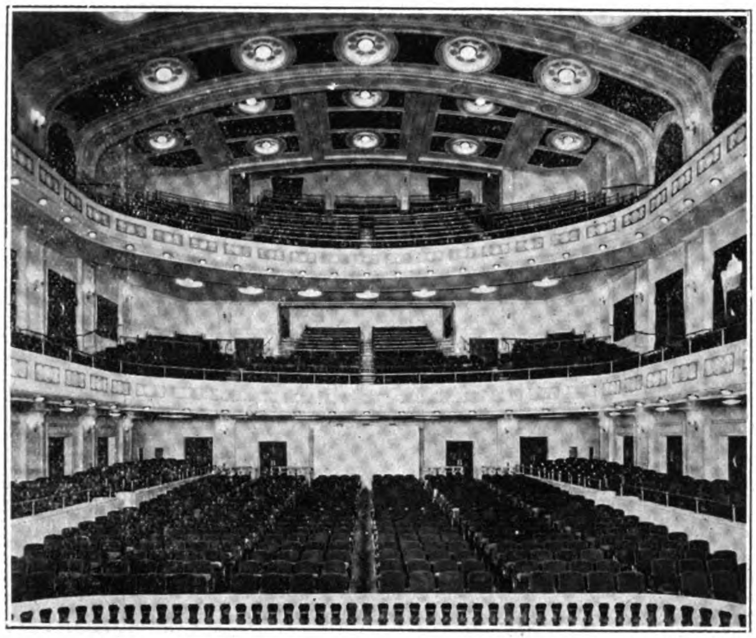
Rotary Lathe Slicing Veneer Sheet from the Log

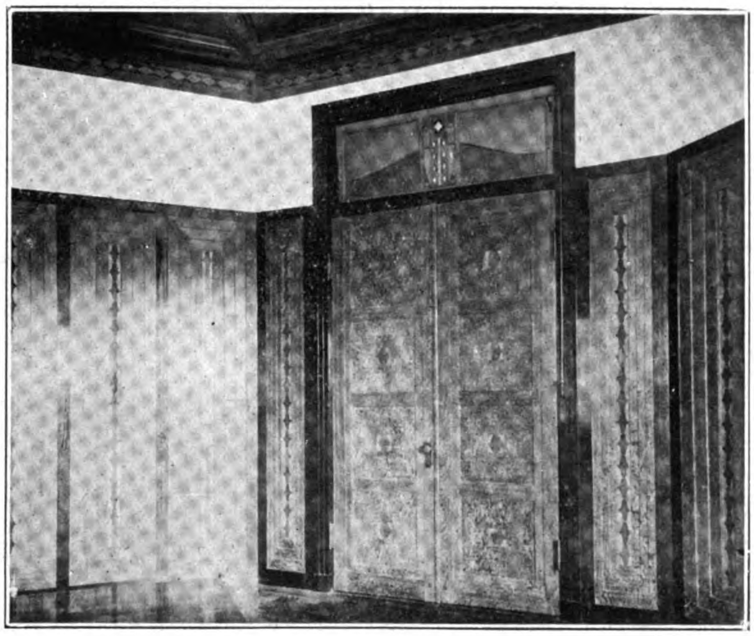


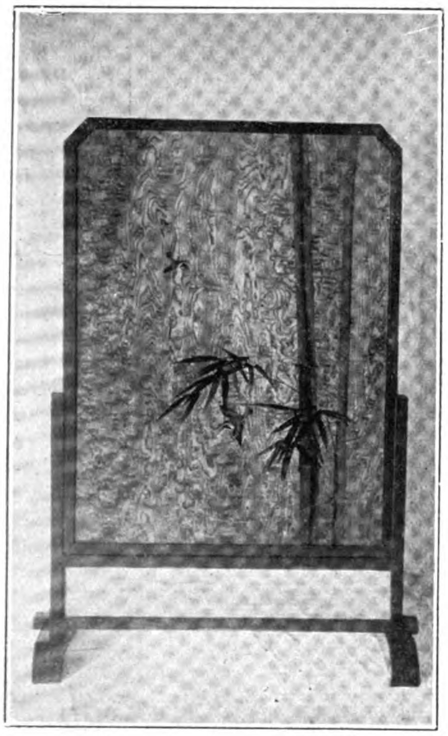
Cutting Veneer Sheets into Standard Sizes



Drying Machine for Veneer Sheets



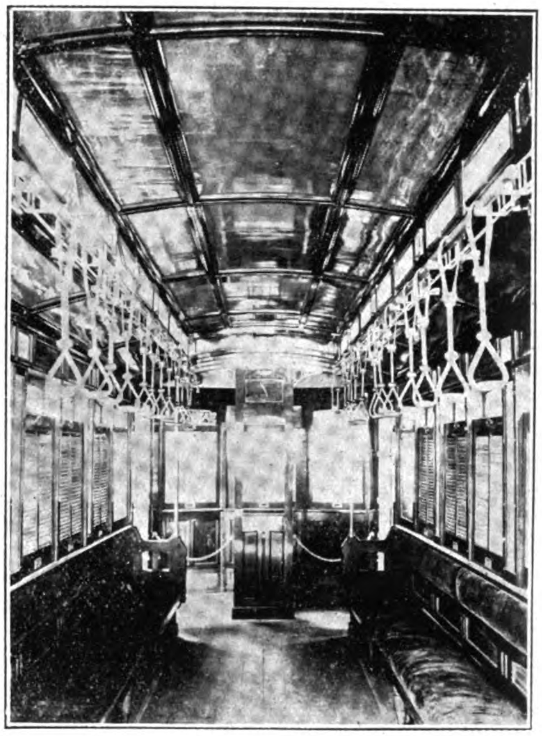


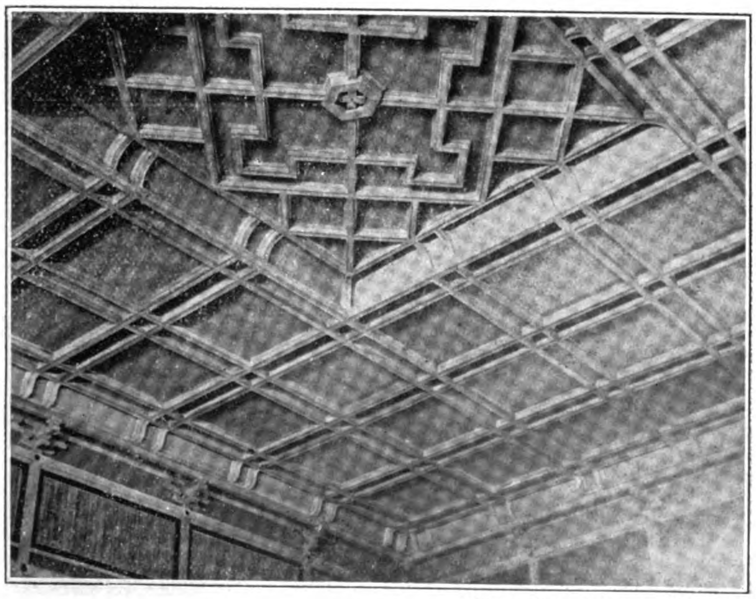


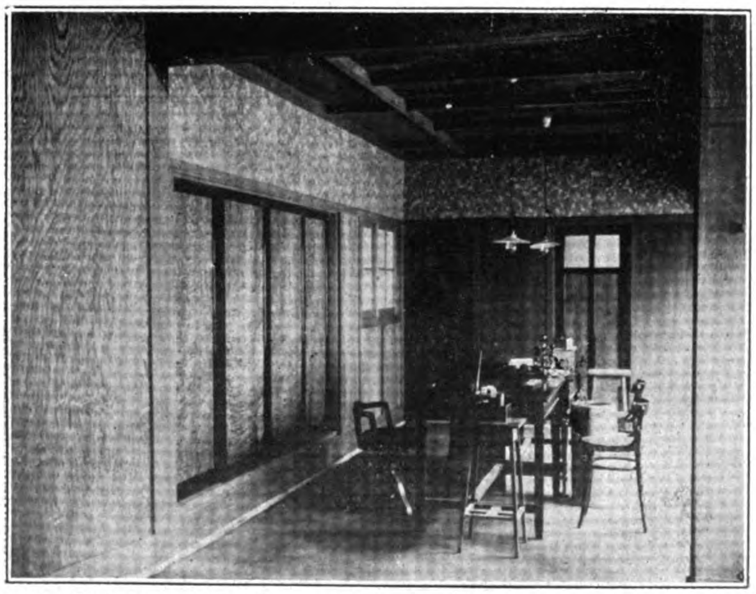
boards of $\frac{1}{28}$ inch to $\frac{1}{16}$ inch thick are produced. This method is mainly applied in manufacturing quarter-sawed oak veneer. Compared with slicing, it results in 30 to 60 per cent., greater loss of wood.

Thin boards thus manufactured contain a large quantity of moisture, and consequently, must be dried before they are fit for veneer. In drying these thin boards, several methods are now in use, but is now generally recognized that the dry kiln process is the best. Great importance is attached to drying, because the advantages characteristic of a veneer board, depend largely upon how well each thin board is dried.

Three, five, or seven sheets of the dried thin boards, which are to be veneered together, are cut to size by a joinder-saw. In making a three-sheet veneer board, the central board goes through a glue spreader roll, whereby both sides of the board are coated, and, then, the two outside boards are placed lengthwise on both sides of the breadthwise glued board. In making five or seven sheet veneer boards, two or four sheets







Examples of Uses of the Products of the Nitta Veneer Works.

Shochiku-za Theatre at Osaka.
Chairs and Interior Woodwork of Oak Veneer.
Ornamental Veneered Ceiling.

Door and Panel of Oak Veneer.
Tramcar in Osaka Finished in Maple Veneer.
Japanese Office Finished in Veneer.

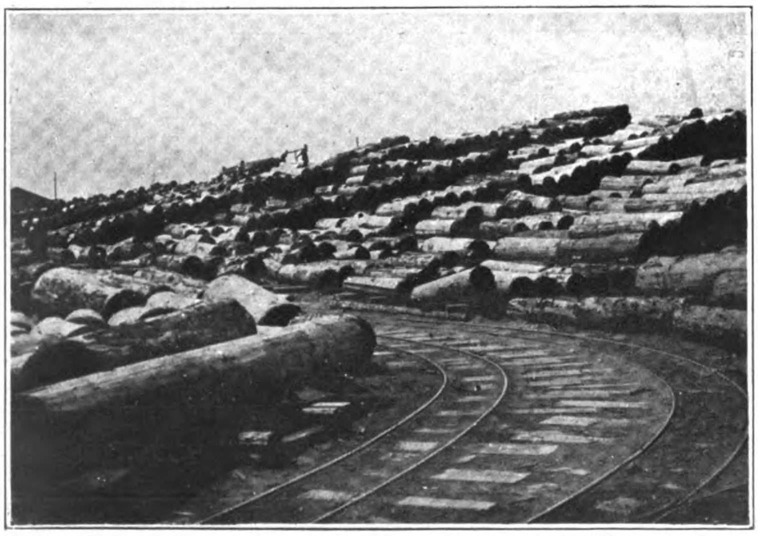
Mill of the Akita Lumber Co. (Akita Mokuzai Kabushi)

are glued above and below the three-sheet veneer board. The glued boards are then put under a hydraulic press of over 100 pounds per square inch. Then a clamp is fixed on the edges while the boards are under pressure. On removing the pressure, the veneered boards are left for more than 24 hours in the clamp. After the clamp is removed, the veneered boards again are dried. With the double cut-off saw and lip-saw, the ends of the dried veneered boards again are trimmed, and then finished with the scraper machine. The veneer boards are then ready to be varnished or painted.

The veneer manufacturing industry was introduced into Japan by the department of agriculture and commerce in 1909. The forestry bureau of the department installed the first veneer machinery in the official saw mill at Kajiya, Miyagi Prefecture. Ten years later, on July 5, 1919, Goshi Kaisha Nitta Veneer Seizosho (The Nitta Veneer Manufacturing Works Partnership) was organized with a capital of Y.500,000, with Mr. Chojiro Nitta as the representative partner, and his son, Mr. Aisuke Nitta, as the chief of the factory, which was built at Yamuwakka, Nakagawa-gun, Tokachi Province, Hokkaido.

The Nitta veneer manufacturing partnership produces approximately 20,000,000 square feet of veneer boards annually and exports to Australia, New Zealand, the United States, Canada, and Europe, in addition to Oriental countries, especially to Shanghai and Manchuria. It has no rivals of importance in Japan. The Hokkaido factory of this company, the buildings of which cover an acre, is equipped with the following machinery, mostly manufactured by the Coe Veneer Machinery Manufacturing Company, of the United States. One 100 inch veneer lathe, one 50 inch veneer lathe, one proctor dryer, annual capacity, 20,000,000 square feet, three hydraulic presses, one sanding machine, one scraper, one slicer, and many other small machines including saws of various kinds.

The Nitta veneer manufacturing partnership is now building a new factory of reinforced concrete in the neighbourhood of the present factory. It will have a veneer door manufacturing factory, necessitated by the recent remarkable increase in the demand for this article. A 120-in. veneer lathe, which was ordered together with many other machines while Mr. Aisuke Nitta was in

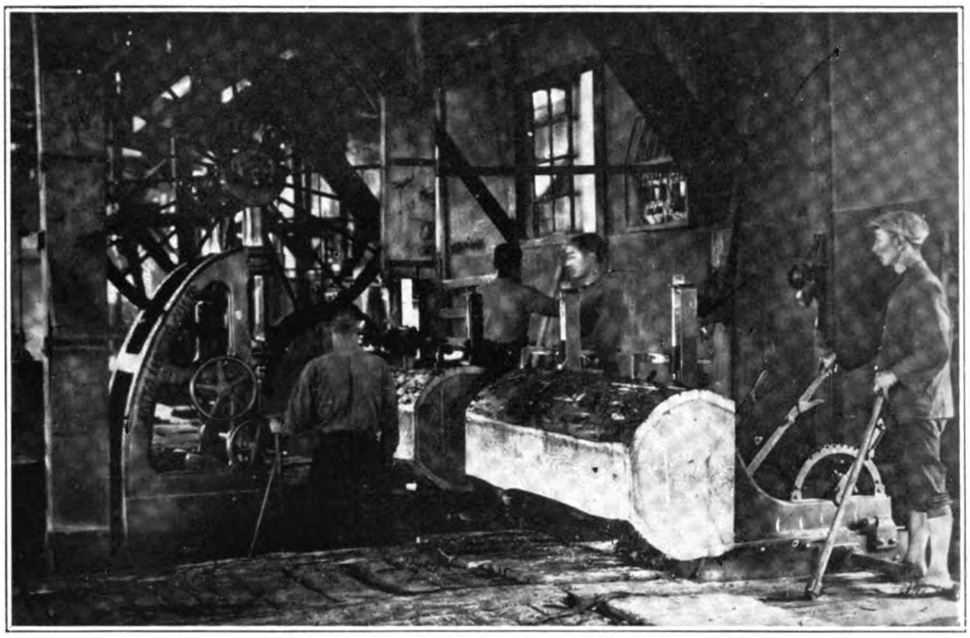


Accumulation of Akita Cryptomeria

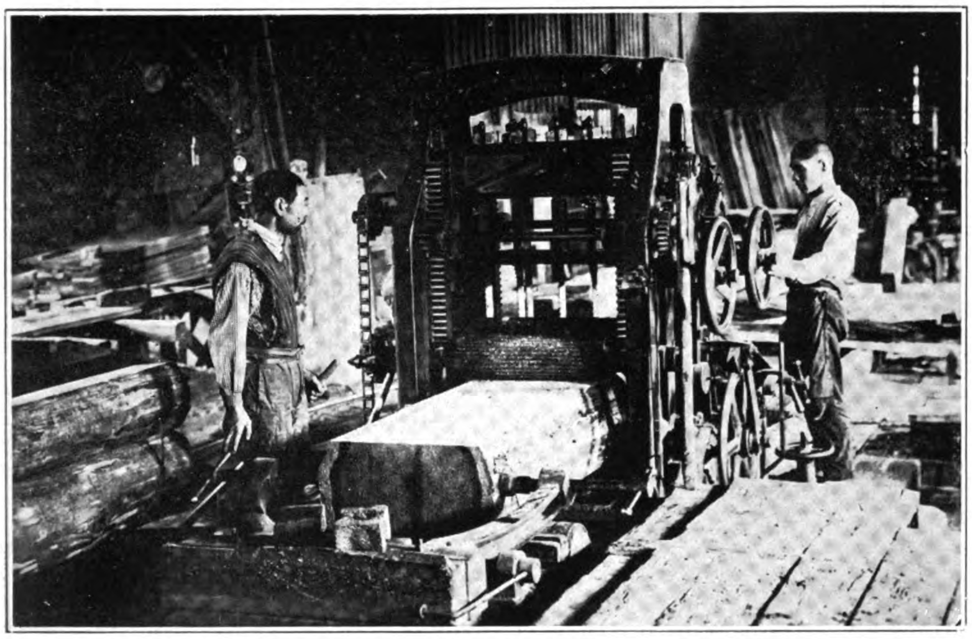
Nami Shibu-ita Drying in the Sun at the Yards of the Akita Lumber Mill

the United States last year, has recently arrived at the Hokkaido factory. This machinery will be set up in the new plant. At the Hokkaido factory, cherry, maple, cottonwood, birch, cryptomeria, ash, and many other trees are made into veneer boards, but the oak veneer is said to be enjoying the largest demand. The standard size of veneer boards made by the Nitta factory is eight feet by four feet. The sizes which are in greatest demand are: 3-ft. by 6-ft.; 2½-in. by 6-ft. and 2-ft. by 6-ft.; but the factory holds a record of having made a veneer board five feet long by 30 feet wide for the Japanese Board of Naval Aviation. The standard thickness is $\frac{3}{16}$ or to ¼ inch.

The Nitta veneer manufacturing partnership has been appointed the official factory for the Japanese navy. Among its customers are the Imperial Japanese government railways, the municipal electric bureaus of Tokyo, Osaka, Kyoto, Nagoya, Kobe and several other cities, the arsenals, the military board of aviation, the naval bases at Sasebo, Kure, Yokosuka, and Maizuru dockyards; the Kawasaki, Fuji-Nagata and Mitsubishi iron works, also the Tanaka iron works, Osaka, the Umebaci and the Japan Rolling Stock Manufacturing Companies, the Shimizu and the Obayashigumi building companies and the Mitsui Bussan Kaisha. The head office is at Kuboyoshi-cho, Namba, Minami-ku, Osaka while branch offices are now established at Tokyo, Nagoya, Fukuoka, and Otaru.



Band Saw at the Akita Lumber Mill



Gang Saw at the Akita Lumber Mill

The New China Guide-book

THE new edition of the Japanese government railways' guide-book to China fully lives up to the high reputation gained by the first edition which was acclaimed by travelers as being the only dependable guide to all of China and the one which really covered the field instead of galloping hither and yon, hitting only the high spots. In its endeavor to present all of China adequately, the new edition even goes so far as to include Chengtu and Mt. Omi, places which most travelers never will see but which some of them might be induced to visit. The first 124 pages of the guide are a comprehensive though necessarily condensed resume of China as a whole, covering communications, population, political system, history, religion and art, in fact, this section of the book is an epitome of things Chinese and may be commended to those who have lived all their lives in China as well as to the casual tourist.

The arrangement of the various trips is from the East, Mukden being the first city described, the cities along the Peking-Mukden line being mentioned in detail to Tientsin. Peking is given exceptionally ample treatment side trips to Kalgan and other points of interest being described. The map of Peking city and another showing the environs that can be reached by motor are a feature that should assist the traveller mightily. The two railway routes from Peking to the Yangtsze are fully treated, every station of importance on both the Peking-Hankow and the Tientsin-Pukow lines is given mention. The Yangtsze Gorges are described in detail and even the Wuchang-Changsha railway is given space as are the various summer resorts in the Yangtsze valley. Returning to Nanking the traveller is given descriptions of the many points of interest on the railway to Shanghai, including Soochow, Changchow, the Taihu and even Huchow although it is off the beaten track. And so it goes—from North to South and East to West, this guide-book shows in every direction the same painstaking care to acquaint the tourist with every possibility of sightseeing. One of the most meritorious features is the array of maps of the various cities, specially prepared ones at that, which outline the points of interest in unmistakeable and ready reference fashion. The Japanese government railways are to be congratulated on this new edition of the only standard guide-book to China.

Simons & Co. Get Steamer Contract

Messrs. Wm. Simons & Co., Ltd., Renfrew, have received an order from The High Commissioner for India for a Twin Screw Cable Steamer for the Indian Government Telegraph Service. The vessel will be built under the direction of Messrs. Sir J. H. Biles & Co., Naval Architects & Consulting Engineers, London & Glasgow.

Armstrong Whitworth Secure Locomotive Contract

It is announced that Sir J. G. Armstrong Whitworth & Co., Ltd., have secured an order for 37 heavy main line locomotives for the Bengal Nagpur Railway. These Locomotives which are intended for goods traffic are of the 2-8-0 superheated type, with 6-wheeled tenders for a gauge of 5-ft. 6-in., and will weigh in working order about 113 tons. The contract has been secured in the face of very keen foreign competition. The engines will be built at the firm's Scotswood Works at Newcastle-on-Tyne, and it is anticipated that some of them will be shipped in running order in accordance with the firm's usual practice.

Shanghai Municipal Electricity Plant

Increase in Kilowatts is True Barometer of City's Industrial Growth

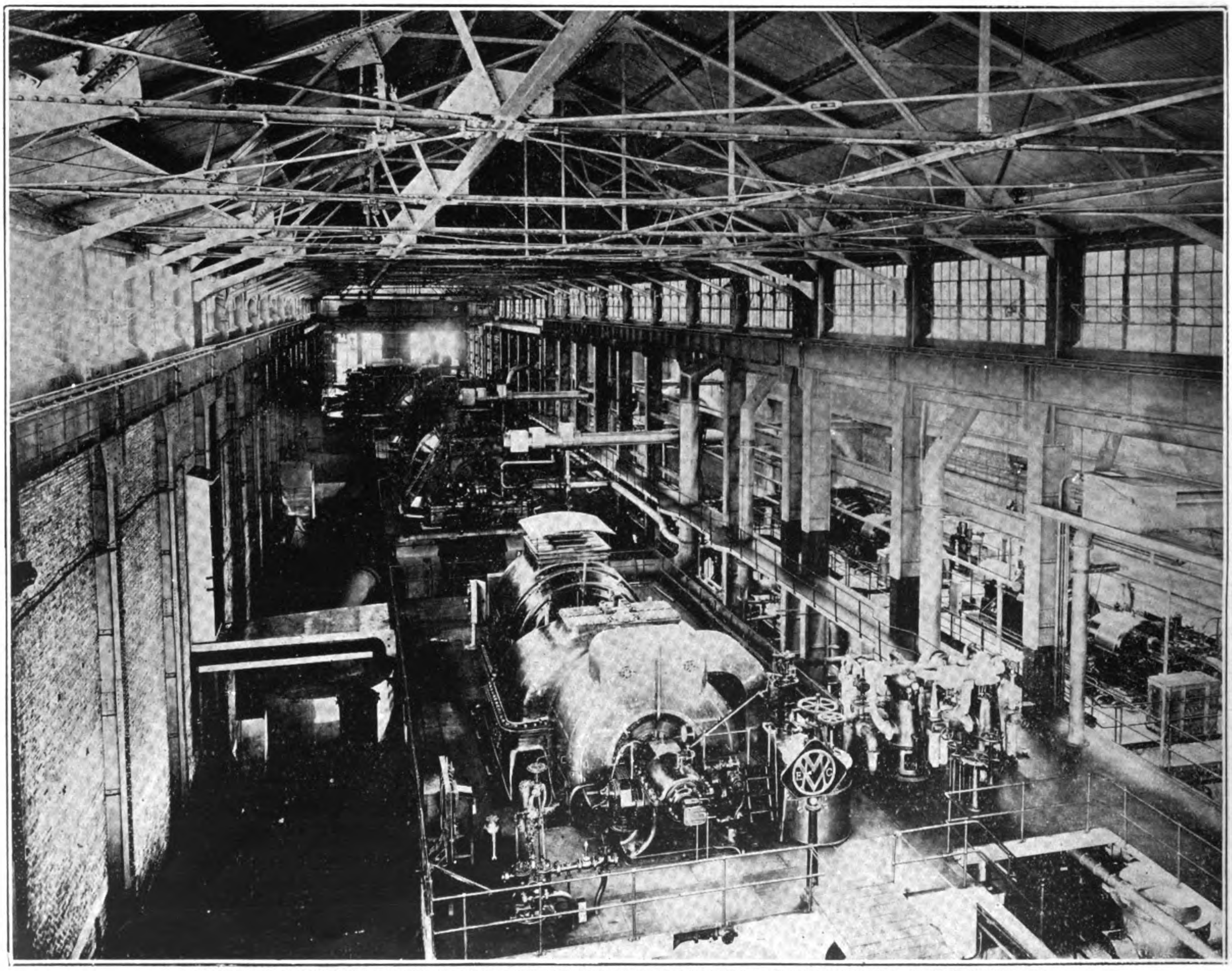
TO one who seeks a true index of Shanghai's industrial growth the report of the municipal electricity department must be illuminating. Likewise to those managers of electrical enterprises in various cities of Britain and America, it is possible that a feeling of envy or at least emulation arises when they scan the figures and curves which go to show that Shanghai is not only one of the best electrified cities in the world, but that it sells a larger percentage of its power than most any other. As an index of industrial progress in the last ten years, nothing can be clearer than the report of the electricity department which shows that in 1913 less than 6,000 horse-power in motors were carried, while in 1923, this item had risen to 101,331 horse-power. That comparison ought to be sufficient tribute to those who have guided the destiny of the department. In that connection, *The Engineer*, Britain's greatest engineering journal, says :

The annual reports of the Shanghai municipal electricity department have been for years of a nature to arouse admiration, if not envy, in the minds of station engineers in this country, and to cause ordinary people to wonder when we shall be able to record a corresponding progress in any of our own areas of supply. Shanghai uses coal for generating purposes, as we do, and although it has a large cotton-mill load it cannot have advantages in this respect over certain parts of Lancashire. If Shanghai had no electricity supply at all, or at best a little antiquated plant, one could find many reasons why matters should be thus ; but when we find a town in "the unchanging East" easily surpassing any municipal undertaking in this country in output of electricity, we have little cause for self-congratulation. The following figures, taken from Mr. T. H. U. Aldridge's annual report for 1923 on the Shanghai undertaking of which he is the manager and engineer-in-chief speak for themselves :—

Year ending	Undertaking.	Units Sold for year.	Load Factor per cent.
1923...	... Shanghai ...	... 272,265,861	49.42
,, ...	... Manchester...	... 185,638,834	29.41
,, ...	... Glasgow ...	... 141,919,196	27.95
,, ...	... Birmingham	... 139,468,153	25.26
,, ...	... Sheffield ...	... 123,438,177	26.96

Financial

According to the annual report of the Engineer-in-Chief and Manager, Mr. T. H. U. Aldridge, notwithstanding the continued trade depression, the sales of electricity in 1923 for various purposes increased from 232,457,361 to 272,265,861 kilowatt-hours, or 17.12 per cent. The result of the year's trading shows a net profit of



RIVERSIDE POWER STATION OF THE SHANGHAI MUNICIPAL ELECTRICITY DEPARTMENT

View of Turbine House Looking South. New 20,000 K.W. Turbo-Alternator and Air Ejectors in Foreground, and two 3,000 K.W. Turbo-Alternators for House Service Supply in Adjoining Bay

Tls. 1,514,884. Whilst the sales of electricity for light, heat and traction come closely to the estimated figures, the sales for power purposes are short by 18,278,115. In the report for 1922 reference was made to the inactivity of most of the flour mills supplied with electric power. During 1923 this industry was more active, and most of the mills were working at intervals. Against this recovery has to be set the falling off of demand in the cotton spinning industry. Although few of the mills actually ceased to run, some of them went on half time, consequently the sales of electricity were lessened proportionately. Mills in which new spinning plant had been added did not put this new machinery into service. Considering the depressed condition of the cotton industry the fact that there has been an actual increase in sales of power may be regarded with satisfaction.

The financial standing of the undertaking at December 31, 1923, is :—

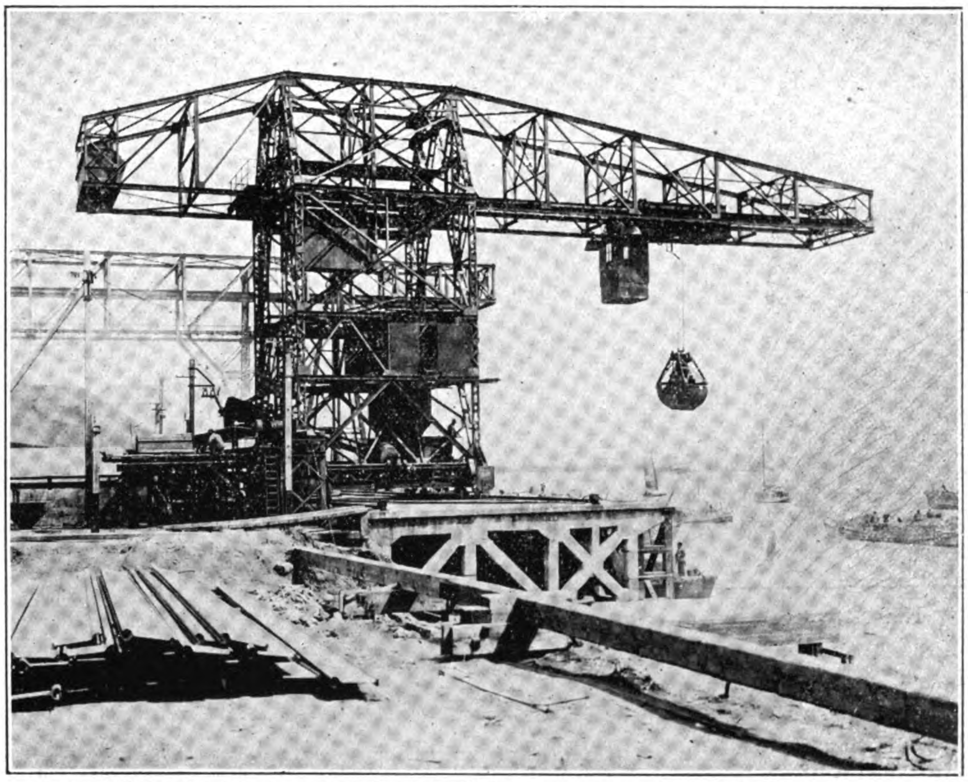
Capital outlay of the undertaking	Tls. 29,599,162
,, ,, on plant actually in use	,, 27,308,196
Return on capital outlay actually in use	10.39%
Revenue from sales of electricity, rent of motors, etc. ..	,, 8,572,449
Gross profit (after allowing for depreciation)	,, 2,836,960
Nett profit after provision for interest on loans and other nett revenue expenditure ..	Tls. 1,514,884

(The estimated net profit was Tls. 1,398,951).

Since 1916, Tls. 3,760,000 of electricity profits has been handed over to the council as contribution to general municipal funds, for application to other municipal purposes. The estimated net profit for the year 1924 is Tls. 1,354,800.

With the exception of a few minor details, the extensions of the riverside power station, sanctioned in 1920, were completed. The installed plant capacity of the station is now 121,000 kilowatts. (This includes the 20,00 k.w. turbine which was destroyed in November last, and is being replaced). The plant comprises the following :—

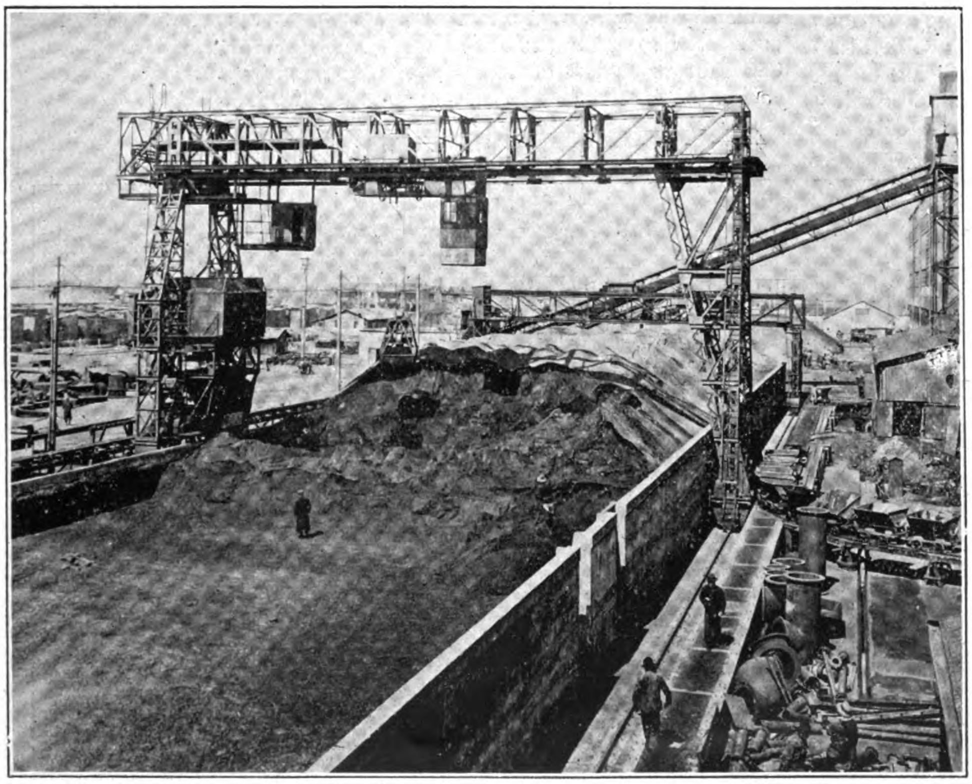
Two 2,000 k.w. turbo-generators ; one of 5,000 k.w. ; three of 10,000 k.w. ; two of 18,000 k.w. ; two of 20,000 k.w. ; and two of 3,000 k.w. for house service supply.



Coal Unloading Transporter, Capacity 100 tons per hour, Riverside Power Station

There are 26 boilers, eight located in No. 1 boiler house, eight in No. 2 boiler house, and ten in No. 3 boiler house, this being the recently completed one built under the 1920 extension scheme.

The equipment of the new super-substation at Fearon Road was almost completed. This substation supersedes the old Fearon Road steam generating station, which is only used now for supplying part of the direct current traction supply to the Tramways Company. In 1924 this old station will be completely shut down and the plant disposed of. Traction supply will then be derived entirely from riverside, conversion from three-phase alternating to direct current being effected at the new super-substation. Another supe-srub-station at Yangchow Road, eastern district, designated " G " substation, is nearly completed and ready for use.



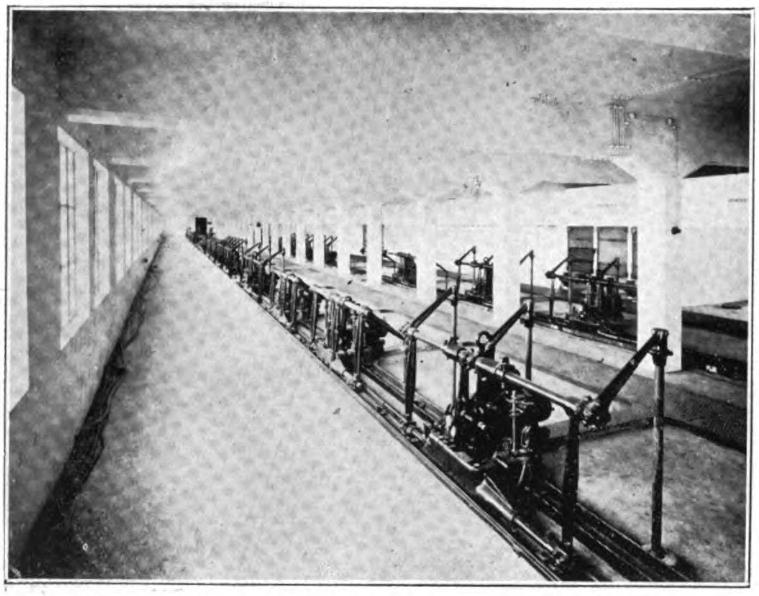
Coal Reclaiming and Stacking Transporter with Coal Conveyor to Boiler House in Background, Riverside Power Station

Kilowatt Hours Generated

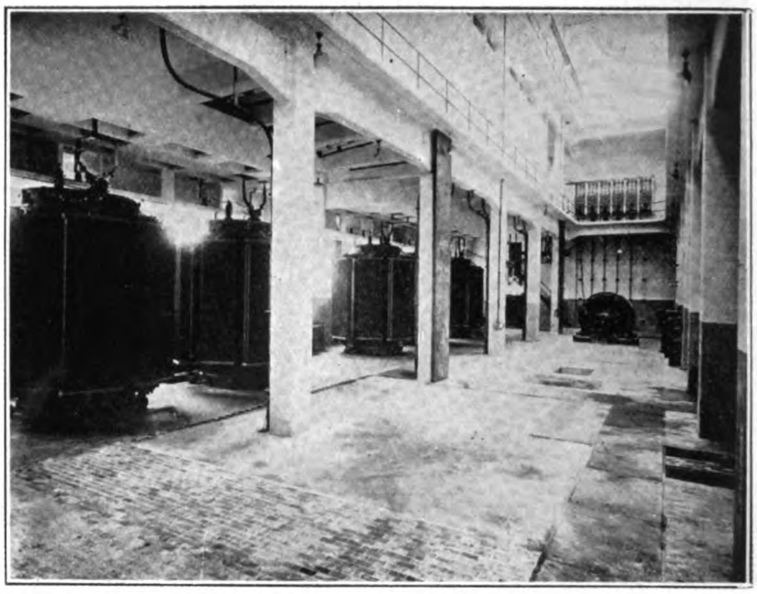
The highest maximum load was 65,632 k.w. The maximum load delivered to the distributing feeders at the same time was 62,903 k.w., an increase of 22.52 per cent. compared with a 25 per cent. increase in 1922 above 1921. The load factor has dropped from 51.5 to 49.42 per cent. The total kilowatt hours generated amounted to 327,876,613, of which riverside accounted for 325,258,465 and Fearon Road 2,618,148 the percentage of the total kilowatt hours generated supplied by Fearon Road being 0.798 only. The kilowatt hours used in both stations directly in the generation of energy were 21,611,482, or 6.59 per cent. of the total generated. The figures for the three previout years were 8.05 per cent., 8.44 per cent. and 6.86 per cent. respectively and 533,381 kilowatt hours were used for miscellaneous purposes such as Fearon Road station lighting, godowns, offices and showrooms, also for office and showroom heating, and energy used by the meter testing department.

Kilowatt Hours Sold

The total kilowatt hours sold amounted to 272,265,861, an increase of 17.12 per cent. over



New 22,000 volt Switch House showing Switchgear Operating Mechanism



Fearon Road Substation showing 4,200 K.V.A. 22,000—6,600 volt, single-phase Transformers and 3,500 K.V.A. Synchronous Condenser

1922 distributed as follows :

	1922	1923	Increase	%
Private lighting	24,793,079	27,626,473	2,833,394	11.43
Public and private street lighting	1,836,419	2,182,615	346,196	18.85
Heating and cooking ...	1,672,459	2,059,774	387,315	23.16
Power	198,549,509	234,419,732	35,870,223	18.06
Traction	5,605,895	5,977,267	371,372	6.62
	232,457,361	272,265,861	39,808,500	17.12

There was a net increase, after allowing for disconnections, of 3,137 additional premises connected to the mains during the year, bringing the total to 39,929 at the end of December. There were 32,921 consumers being supplied at the end of the year, compared with 30,272 at the end of 1922, an increase of 2,649. The new connections added during the year amounted to 17,406 kilowatts. Previously the connected kilowatts represented by public street lighting and the Tramways Company have not been included, but in order to make the total complete these are now for the first time included. They are 341 and 3,960 kilowatts respectively. The total kilowatts connected are now 114,949.

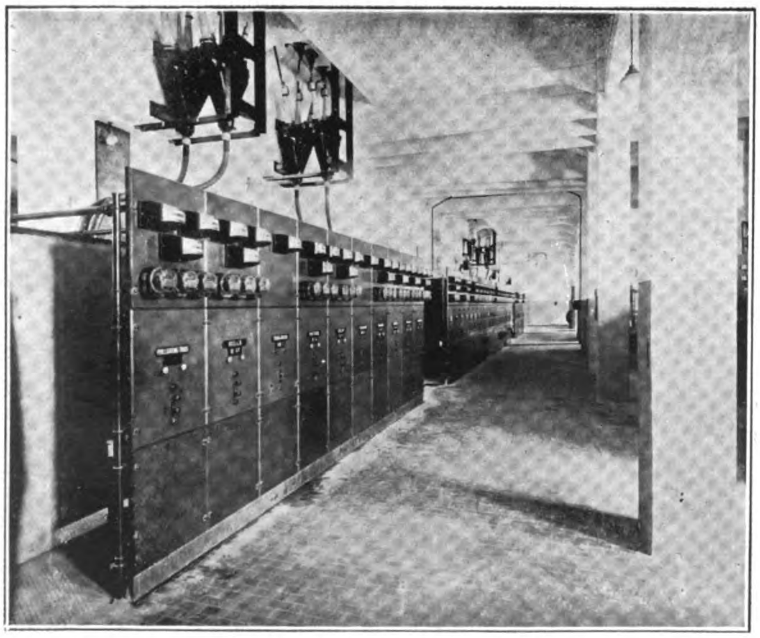
A summary of underground work shows the following additions laid during 1923:—22,000 volt cable, 3.14 miles; 6,600 volt cable, 11.39 miles ; telephone and pilot cable, 8.31 miles ; public lighting cable, 1.60 miles ; and low-tension cable, 4.15, a total of 28.59 of new work making the total mileage 301.40. A net increase of 3,053 miles was shown in overhead work. Public street lighting has increased 11 per cent. during the year, which is an increase of 42 per cent. over the previous year's connections.

The increase in power is as follows :—

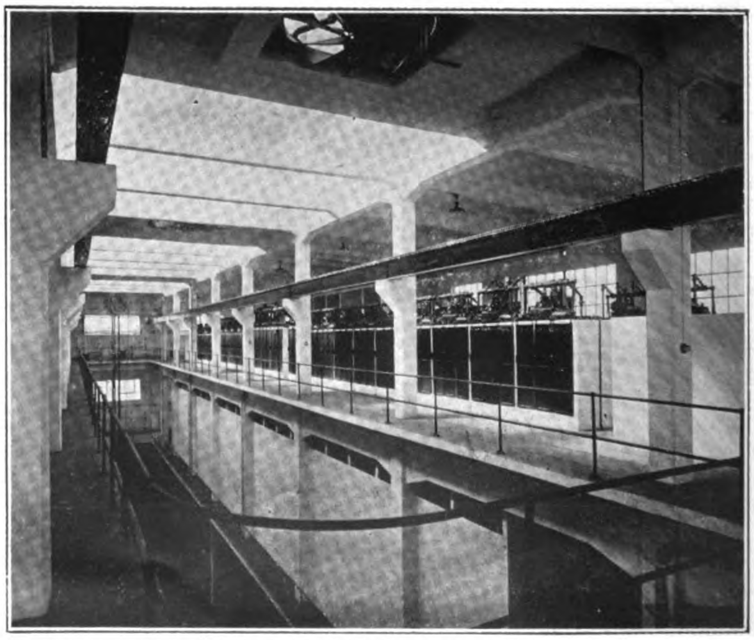
	Number	*Horse-power*
Hired motors disconnected during 1923: ..	67	109.30
Consumers' motors connected during 1923 : ..	914	23,743.12
Net total increase for the year after deductions in respect of disconnections :	847	23,633.82
Total hired motors connected, December, 1923	840	17,373.65
Total consumers' motors	3,636	77,417.28
Total lift and direct current motors connected	329	6,540.65
	4,805	101,331.58

From the 23,743.12 h.p. of consumers' motors connected during 1923 must be taken 5,310 h.p. of motors used in connection with the tramway system in the settlement, which are being recorded as connected load for the first time. This leaves 18,323.82 h.p. and 653 motors as the ordinary net total increase for the year after deductions in respect of disconnections for 1923.

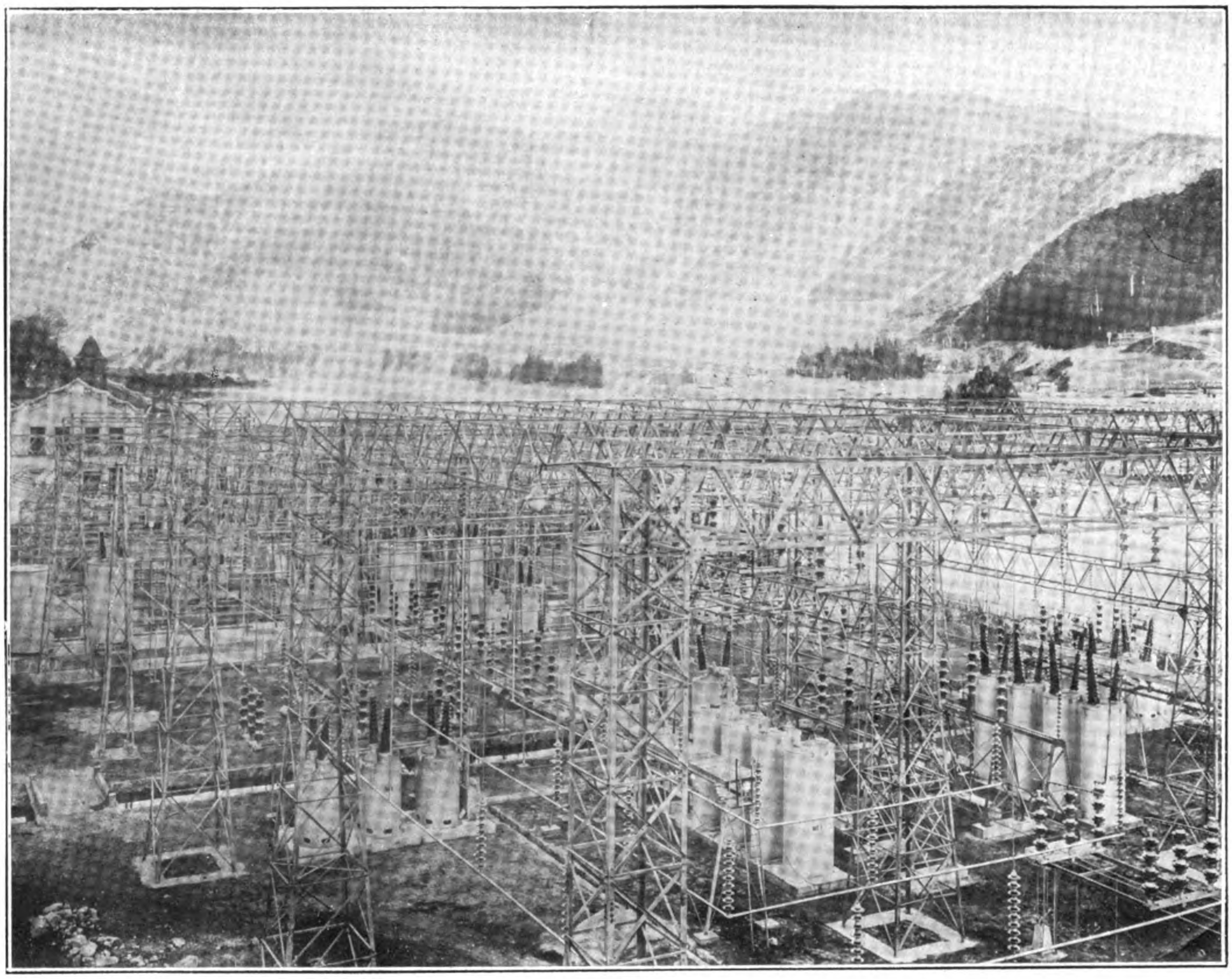
(Continued on page 397.)



Fearon Road Substation showing 6,600 volt, Control Board



Fearon Road Substation showing 6,600 volt, Switch Gallery



SUHARA SWITCHING STATION OF DAIDO POWER CO.

It Controls Two 10,000 k.v.a., 77,000 Volt; Two 15,000 k.v.a. 15,000 Volt; and Two 30,000 k.v.a., 77,000 Volt Incoming lines, also Three 27,600 k.v.a. Transformer Banks of 77,000, 154,000 Volts and Two 55,000 k.v.a., 154,000 Volt Outgoing Lines

Japanese High Voltage Transmission Systems. III*

By S. Q. Hayes, General Engineer, Westinghouse Electric and Manufacturing Co., in the Electric Journal

MOST of the power for the Tokyo district is developed and distributed by the Tokyo Electric Light Co., or some of its subsidiaries. The latest developments are those connected with the delivery of power to the new Kameido terminal station in Tokyo.

The general scheme covers the development of power on the Shinano River (Shinanogawa), Nakatsu River (Nakatsugawa) and Tone River (Tonegawa), for transmitting power at high voltage to Tokyo. Fig. 1 shows the system schematically. Under the name of Shinyetsu Denrioku, a subsidiary company of Tokyo Dento, construction work is under way for the Shinanogawa power house on the Shinano River, and two power plants known as Nakatsugawa No. 1 and Nakatsugawa No. 2 on the Nakatsu River.

The generating equipment and low-tension switching equipment has been, or will be, purchased by the Shinyetsu Denrioku. The step-up transformers and high-tension switch gear have been, or will be, purchased by the Tokyo Dento who will build the transmission lines, starting with two circuits and later adding a third one. Each line is designed for about 75,000 k.v.a. normal capacity, 150,000 k.v.a. emergency rating.

At a point approximately three miles from the Shinanogawa power house, the 1.5 mile branch lines from the Nakatsugawa power house No. 2 will be tapped in. Three miles farther on, lines from the Nakatsugawa power house No. 1, approximately 1.5 miles distant, will be tapped in. From this point, the lines will be continued in two sections, 9 and 15 miles long respectively to the Fujuko switching station. Here arrangements are made for sectionalizing the main transmission lines, and for tying in the five-mile branch line from the Komatsu station of the Tone River development. Here a tie is made by means of three-winding transformers to the 66,000 volt distribution system of the Tokyo Electric Light Co. and to Kohchi, Komatsu, and Kamikuya, three generating stations of the Tone River development. From the Fujuko switching station the lines are continued 22 miles to Maebashi junction.

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*Concluded from page 760 of December 1923 issue.

Two new 154,000 volt steel tower lines are being completed by the Tokyo Electric Light Co. from the Shinanogawa power house to the Maebashi junction, but until the completion of the Shinanogawa power house and the new tie-in transformer station at Komatsu the lines will be operated as far as Maebashi junction at 66,000 volts. The two lines were completed from Maebashi junction to Tokyo in December 1923 and a third 154,000 volt line from Shinanogawa to Tokyo will be completed by October 1926.

The existing 66,000 volt lines, of wooden pole construction, from Maebashi junction into Tokyo will be utilized for the present. Eighteen miles from Maebashi junction there is to be a new switching station (Kumagaya). The lines then proceed a distance of 43 miles toward Tokyo, and then branch 9 miles to Kameido and 10 miles to a future substation at Tabata.

In addition to the power being developed on the Shinano, Nakatsu and Tone Rivers, the Tokyo Electric Light Co. at present receives 40,000 to 50,000 k.v.a., through the Tabata substation of the Inawashiro system. At the Waseda substation, power is received from three small stations known as Fuefuki No. 1, No. 2, and No. 3, each with one 3,000 k.v.a. generator and also from a larger generating station at Komabashi on the Katsuragawa where there are six 3,900 k.v.a. generators.

At the Yodobashi substation, power is received from the Yatsuzawa generating station on the Katsuragawa, containing seven 7,700 k.v.a. generators. There are a few smaller steam plants totaling approximately 19,000 k.v.a. and a few other hydro-electirc power plants which furnish power directly to the Tokyo Electric Light Company's system.

Under the name of Keihin (also a subsidiary of the Tokyo Electric Light Co.) power is delivered at 154,000 volts to a substation near Yokohama, approximately 18 miles from Tokyo. Interconnections exist between the various stations.

Under the name of Gumma Denrioku, a company at present independent, power is delivered to Kawasaki approximately half way between Tokyo and Yokohama. The feeder voltages for Tokyo, Keihin and Kawasaki are so selected as to permit interconnection. The present feeder voltage is 11,000 volts but this will later be changed to 22,000 volts.

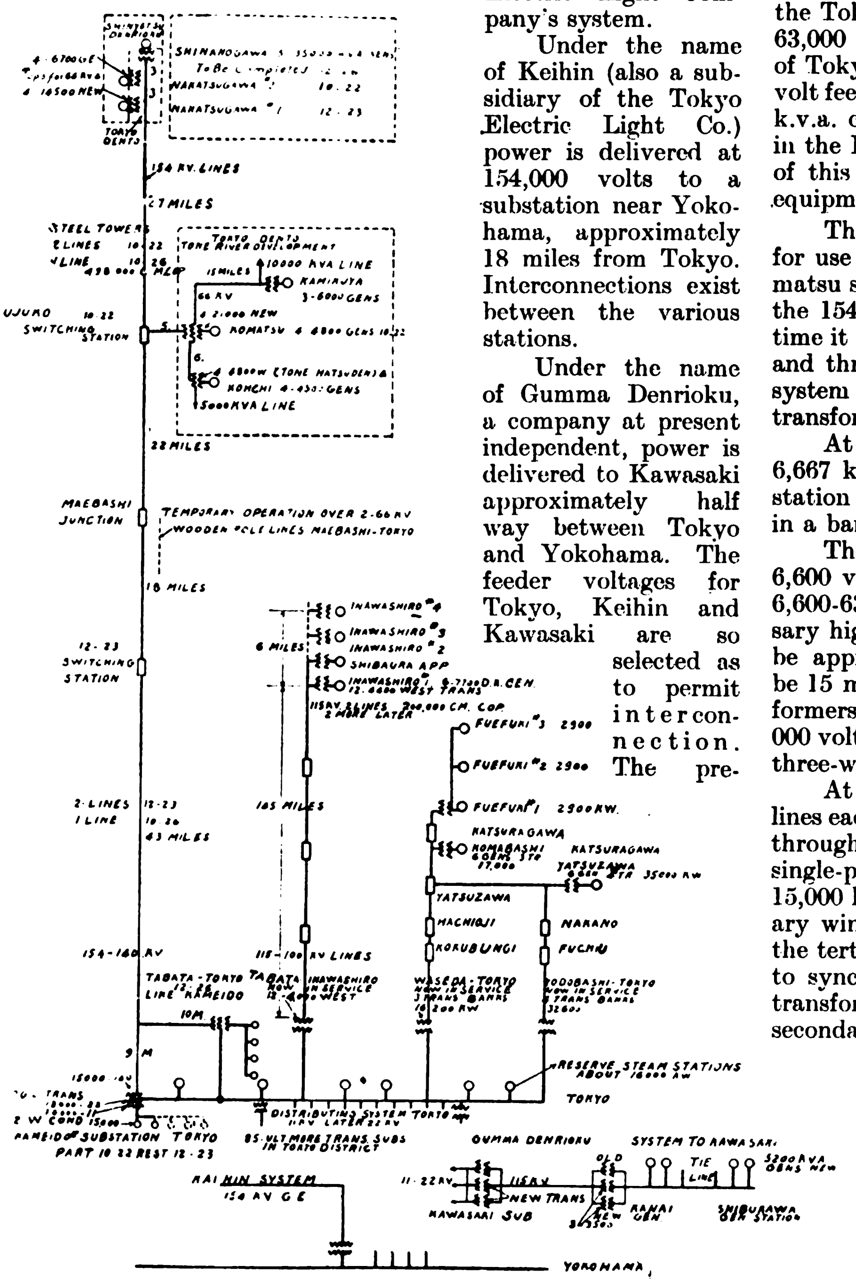


FIG 1 —SCHEMATIC DIAGRAM OF THE TOKYO ELECTRIC LIGHT COMPANY'S POWER SYSTEM

Exclusive of Keihin and Gumma, the Tokyo Electric Light Co. will have available by 1926 approximately 400,000 k.v.a. to be delivered to Tokyo, and the Daido Electric Power Co. is contemplating extending their lines to Tokyo, arranging to deliver approximately 100,000 k.w. to Tokyo within the next ten years.

Nakatsugawa No. 2 Station (Shinyetsu Denrioku)

This station contains two 9,500 k.v.a. generators with their exciter equipment. The two generators operating in parallel supply power to a bank of three 6,667 k.v.a. single-phase, step-up transformers, with one spare transformer. The transformers are connected for 11,000 volts delta, 154,000 volts star; but are provided with taps to allow for operation at 66,000 volts delta. A neutral grounding resistor having a capacity to pass 100 amperes for ten seconds has been provided with these transformers.

At the Fujuko switching station, horn break switches of 600 ampere capacity are to be used for cutting off the five-mile line between the Fujuko switching station and the Komatsu transformer station.

Tone River Development (Tone Hatsuden)

For the Komatsu transformer station there are being built four 21,000 k.v.a. single-phase transformers in one bank with one spare transformer. These transformers are to be provided with three windings, one of 21,000 k.v.a. capacity, at approximately 154,000 volts, connecting to the 154,000 volt transmission system of the Tokyo Electric Light Co.; one of approximately 15,000 k.v.a., 63,000 volts which connects to the 66,000 volt distribution circuit of Tokyo Electric Light Company, and ties in, by means of 66,000 volt feeders, to the Kamikuya and Kohchi stations; and one of 6,000 k.v.a. capacity, 6,600 volts is for the circuits from the generators in the Komatsu station. The switching equipment for the control of this transformer bank will form an addition to the switching equipment now installed at the Komatsu power generating station.

The six 4,800 k.v.a., 6,600-63,000 volt transformers, supplied for use as two star-connected 110,000 volt banks, now in the Komatsu station, will be used, connected in delta, at 63,000 volts until the 154,000 volt transmission line is put into operation. At that time it is likely that three transformers will be shifted to Kamikuya and three to Kohchi where they will feed the 66,000 distribution system and tie in on the 66,000 volt windings of the 21,000 k.v.a. transformers that will replace them at Komatsu.

At the Kamikuya generating station there will be installed three 6,667 k.v.a., 6,600 volt, three-phase, 50-cycle generators. In this station there will be utilized three 4,800 k.v.a. transformers arranged in a bank stepping up from 6,600 volt delta to 63,000 volt delta.

The station at Kohchi will probably contain four 4,500 k.v.a. 6,600 volt generators, three 4,800 k.v.a. single-phase transformers, 6,600-63,000 volts delta, transferred from Komatsu, and the necessary high- and low-tension switching equipment. This station will be approximately six miles from Komatsu, and Kamikuya will be 15 miles from Komatsu. Possibly at some later date, tie transformers may be located at Maebashi for connecting together the 154,000 volt and the 66,000 volt circuits, although it is probable that the three-winding transformers at Komatsu will perform this function.

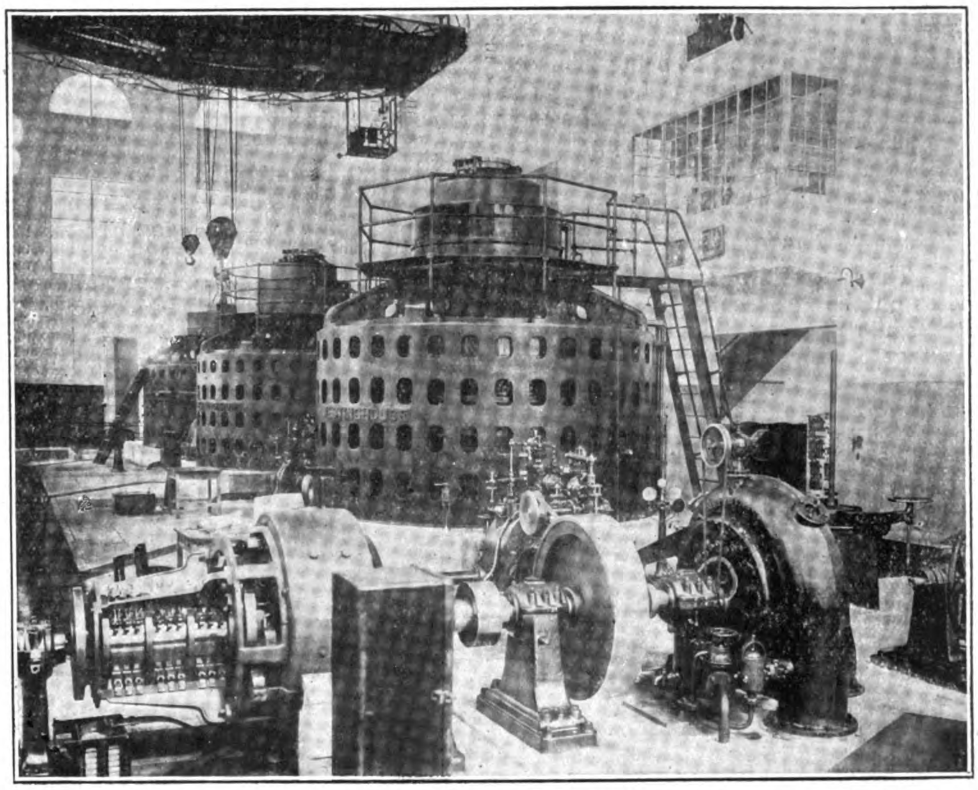
At the Kameido station there are two 140,000 volt incoming lines each of approximately 75,000 k.v.a. capacity. These lines feed through three transformer banks, each bank comprising three single-phase units with three windings. The primary winding of 15,000 k.v.a. capacity will be used for the incoming line, the secondary winding of 18,000 k.v.a. capacity for power distribution, and the tertiary winding of 10,000 k.v.a. capacity for supplying current to synchronous phase modifiers. The primary winding of these transformers will be connected in star for 140,000 volts. The secondary winding will be connected in star to operate temporarily at 11,000 volts for power distribution, but arranged for ultimate operation at 22,000 volts. The tertiary winding, connected in delta, is so designed that one bank of transformers can be used with two 15,000 k.v.a. synchronous phase modifiers.

The general scheme of operation contemplates utilizing synchronous phase modifiers in such a manner as to maintain 11,000 or 22,000 volts on the secondary winding of the transformers, this corresponding with approximately 140,000 volts on the primary.

In the Kameido station there are installed two 15,000 k.v.a. synchronous condensers. Each of these condensers is provided with a 145 k.w. direct-connected exciter and a 1,000 h.p. wound rotor starting motor. For use with the synchronous condensers and their exciters respectively are provided motor-operated field rheostats, field discharge resistors, control panels for the motors, and oil pressure pump outfits for the synchronous condensers. For supplying the voltage to start the synchronous condenser or for driving the motor, there are two step-down transformers having a nominal rating of 1,800 k.v.a. each. The connections to the synchronous phase modifier are made so that the tertiary windings of transformer banks Nos. 1 and 3 can be connected either to the 11,000 volt bus or directly to one of the synchronous phase modifiers, while the connections for transformer bank No. 2 are made to the bus.

The station building is arranged to house the two present and the three future phase modifiers as well as the local service transformers, the starting transformers and all of the switching equipment for the 11,000 and 22,000 volt circuits.

All of the 11,000 and 22,000 volt circuit breakers are of the cell type and, to facilitate the work of the concrete contractor, scale models were made up of most of the structures and the circuit breakers, disconnecting switches and the bus bars supports. The connections were all made up in miniature.



Three 17,000 k.v.a. Generators, 60 Cycle, 6,600 volt in Yamikiki Generating Station of Daido Power Co.

There are two 22,000 volt power bus structures, one 11,000 volt structure for the running connections of the synchronous phase modifiers and a 2,700 volt structure for the starting bus.

From the Kameido station, power distribution is made by means of underground cables at 11,000 volts, later to be changed to 22,000 volts. These main feeders supply power to various substations and can be connected to corresponding feeders from the Yokohama substation of the Keihin Company and the Kawasaki substation of the Gumma Electric Power Company.

The interconnections of the various receiving stations in Tokyo and the different substations are shown on Fig. 2. The data relative to the stations of the Tokyo Electric Light Company, approximately correct to end of 1921 can be summarized as follows:

Reserve Steam Plants—Asakusa 4,000, Enoshima 225, Kanagawa 14,500, Yokosuka 850; total 19,575 kw.

Present Water Power Plants—Fuefuki 9,000, Iwamuro 18,000, Kamikuya 2,400, Kifune 550, Komabashi (Katsuragawa) 19,500, Minowa 3,500, Takatsudo 350, Tomosawa 3,300, Tsuchimura 14,000, Yatsuzawa (Kat suragawa) 48,200; total 118,800 kw.

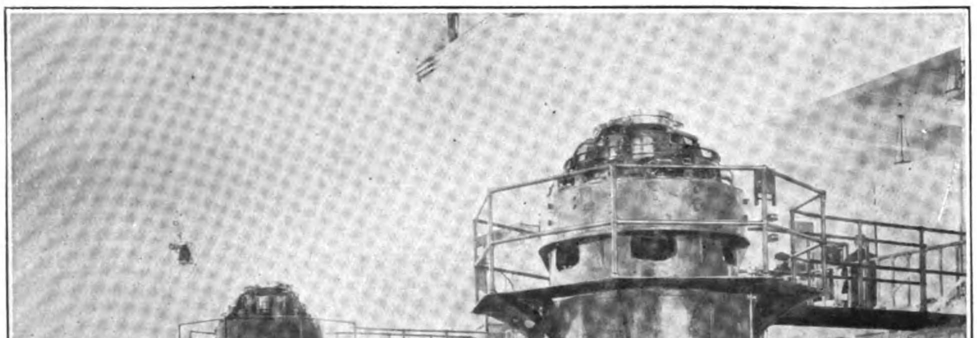
Purchased Power—Akigawa 70, Chiba 810, Fuzigasu 12,000, Goida 350, Gumma 50, Inawashiro (Tabata) 40,070, Ishioka 200 'Katsuragawa 11,000, Keio 500, Keisekido 470, Kinugawa 10,650, Nishige 300' Shitana 650, Tsuru 700, Teiko Kulengo 2,000; total 79,400 kw.

Total power available at end of 1921 ...	217,775	kw.
Under Construction :—		
Nakatsugawa No. 2 for completion 1922	20,000	,,
Komatsu for completion 1922	19,200	,,
Total for completion 1922	39,200	,,
Nakatsugawa No. 1 for completion 1923	43,500	,,
Kochi for completion 1923	18,000	,,
Total for completion 1923	61,500	,,
Kamikuya for completion 1926	18,000	,,
Shinanogawa for completion 1926 ...	175,000	,,
Total for completion 1926	193,000	,,
Total power available at end of 1926	511,475	,,

The present transmission lines of the Tokyo Electric Light Co. terminate at Yodobashi and Waseda; the Inawashiro lines at Tabata, the Katsuragawa and Kinugawa lines at their own substations, the voltage being stepped down to 11,000 volts for transmission to various substations and large customers.

The new lines of the Tokyo Electric Light Co. will terminate at the Kameido terminal station, which will be partly completed by the end of 1922 and finished by the end of 1923, and the new Tabata terminal station. Equipment now on order for the Kameido terminal station comprises three 45,000 k.v.a. transformer banks, and two, later five, 15,000 k.v.a. synchronous phase modifiers. The new Tabata terminal station will have about the same equipment.

Substations installed at the end of 1921 amounted to 82 in number, making a total installed k.w. capacity of 219,810 k.w. Present interconnections between substations are made at 11,000 volts (later 22,000) with distribution at 3,500 volts. Twenty-one large customers take 26,410 k.v.a. at 11,000 volts.



Two 15,000 k.v.a. Generators in Momoyama Generating Station of Daido Power Co., 50-60 cycle, changing to 60 cycle by changing from 250 r.p.m. star connection to 300 r.p.m. inter-connected star. Exciter 320 kw, also spare motor driven exciter

While there are many interesting features connected with the different transmission lines into Tokyo, the Inawashiro system is particularly notable as being the first system in Japan to operate at a potential higher than 77,000 volts and the only plant so to operate until very lately. Many of the engineers now prominent in the various power transmission companies of Japan have been connected with the Inawashiro system and obtained their first high-tension experience with that Company.

Inawashiro Hydro-Electric Company

The Inawashiro Hydro-electric Power Company has four power sites on the Nippashi River, the outlet of Lake Inawashiro, and transmits power a distance of about 145 miles to Tokyo with a voltage at the generating stations of about 115,000 volts and at Tokyo of about 100,000 volts.

For the first plant, the water is diverted from the river, shortly after it leaves the lake, and is taken in an open canal varying in width from twenty to thirty feet, with an average depth of about 13 feet. Several hills are pierced by tunnels, and across some of the valleys the canal is carried on bridge construction. The canal ends at a large settling basin, or forebay, and a separate penstock of welded steel pipe 75 to 87-in. diameter, 1,420 feet long, is provided for each of the six generator units, and a single penstock 25.5-in. in diameter, 1,420 feet long is provided for the exciter wheels. The penstocks are held in seven massive concrete anchorages, wherever there is a change in the slope. Three of these anchorages are hidden by the building. The overflow from the forebay is to the right of the penstocks. The line supplying power to the headgate house as well as the steps and path leading from the power plant to the forebay, are at the left of the penstocks. The hoods over the ventilating ducts which supply cold air for the generators are between the lower windows.

Power station No. 1 contains six 10,000 h.p. Francis horizontal shaft waterwheels, running at 375 r.p.m., under a head 350-ft., of each driving a 7,000 k.w, 7,777 k.v.a., 6,600 volt, three-phase, 50-cycle generator. There are also four 300 h.p. impulse type waterwheels running at 600 r.p.m. each driving a 200 k.w, 250 volt exciter with voltage controlled by automatic regulators.

The generating station also contains four banks of step-up transformers, each comprising three 4,400 k.v.a. units connected delta-delta 6,600 to 115,000 volts. These transformers are of the indoor type and arranged in compartments which are provided with steel roller doors. Each transformer is mounted on a truck so that it can readily be rolled out into the generator room to be handled by a crane.

The step-up transformers in station No. 2, feed into two 115,000 volt tie lines connecting to station No. 1. It was the original intention, when this system was first designed, that stations Nos. 3 and 4 should also be connected to the tie lines running to station No. 1, which was to be the controlling point for the power generated in all four stations. From station No. 1, there are now two three-phase, 115,000 volt outgoing circuits transmitting power to Tokyo. The original scheme called for four outgoing circuits and two incoming tie lines fed from the other three stations. While the equipment for station No. 2 followed out the original plan, and the transformers in that station feed directly into two lines connecting to station No. 1, it is very probable that the plan for stations No. 3 and No. 4 may be considerably modified, and that a higher voltage, very likely 154,000, will be utilized for the additional lines to Tokyo.

Generating station No. 1 now contains its full ultimate equipment, except that provision may have to be made for some additional high-tension circuits, when the two additional generating stations are installed. At three points along the transmission line, namely, Shirakawa, Utsunomiya and Koga, intermediate outdoor switching stations are installed for sectionalizing the two present transmission lines and provision is made for sectionalizing two future transmission lines.

The receiving station at Tabata in the outskirts of Tokyo, was originally arranged for two incoming 100,000 volt lines. Twelve 4,000 k.v.a., single-phase, 50-cycle transformers arranged in four groups of three each, step down from approximately 100,000 to 11,000 volts. The equipment of this receiving station will be practically doubled in size when the additional generating stations are installed. If a higher voltage is used for transmitting power to Tokyo, it is very likely that the new transformers will be arranged for outdoor service, whereas if the voltage is maintained at 115,000 volts, indoor equipment may be utilized.

In 1913, the order for the transformers, covering twelve 4,400 k.v.a. and twelve 4,000 k.v.a. units or a total of 100,800 k.v.a., was the largest order placed at one time for transformers, particularly for high voltage service. All of these transformers are single-phase, 50-cycle, and are connected delta-delta. In order to take care of the low-voltage alternating-current circuits needed at the generating station, and at the receiving station for light and power service, there are two 150 k.v.a., three-phase, 50-cycle transformers installed at each station.

In order to insure the dryness and purity of the oil used for insulating the transformers, oil circuit-breakers, and lightning arresters, oil-treating outfits have been supplied for the generating and receiving stations, to keep the oil free from moisture and sediment. Each of these outfits consists of a filter press with a capacity of 10 to 12 gallons per minute and a rotary pump. To facilitate filling and emptying the tanks of the transformers, circuit-breakers and arresters, a very complete piping system was installed and equipped

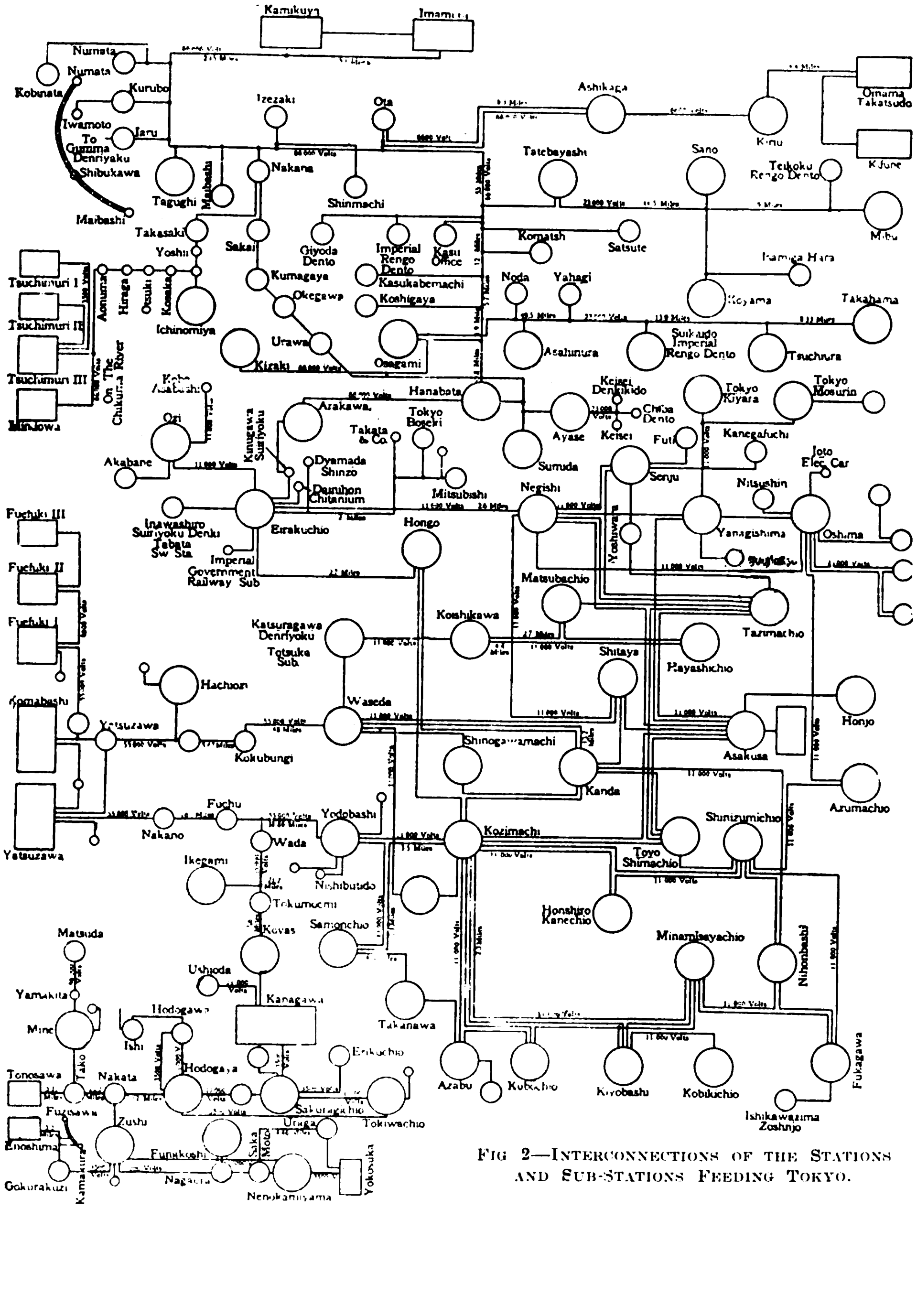
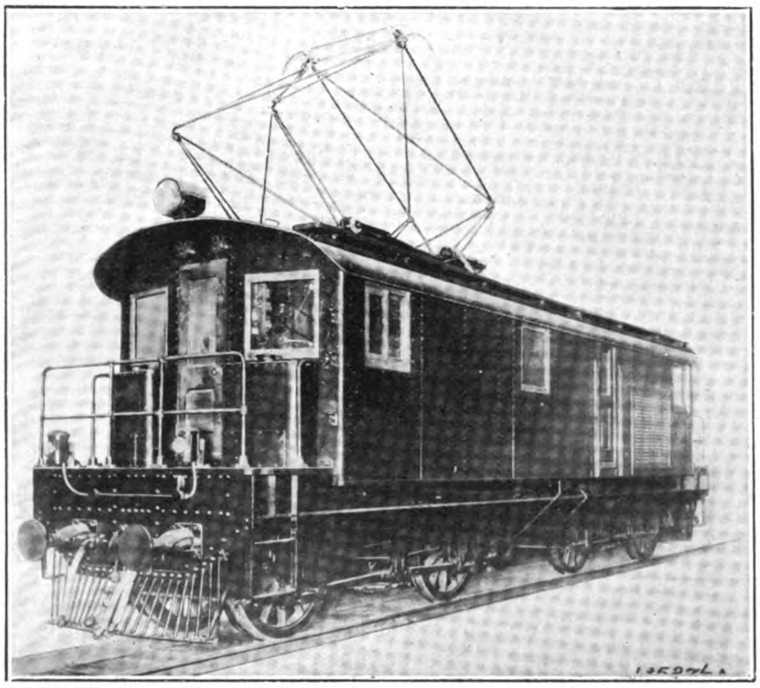


FIG 2—INTERCONNECTIONS OF THE STATIONS AND SUB-STATIONS FEEDING TOKYO.



JGR Loco—040 by 040—Freight Service 55 met. tons. First sample loco. to arrive in Japan. Delivered Dec. 1922. 1,200 H.P. on 1,500 volts arranged for operation on 600 volts, 1,200 volts and 1,500 volts, 49″ drivers, rigid wheelbase 9′ 1″. Length over buffers 40′ 7″, width over all 9′ 2″. Motors 300 H.P. 750 volts two in series, 1,500 volts direct geared through spring gear, Field Control. Control: Gear ratio 16/72. Westinghouse Type HLF. Unit Switch. The only locomotive furnished which is arranged for the installation Regenerative Braking, space being left in the cut and circuit arrangements made so as to provide for

with a direct-acting 4 by 6-in. tripl expump having a capacity of approximately 50 gallons per minute.

As the high-tension switching and transforming equipment in the Inawashiro generating station and the Tabata receiving station is of the indoor type, provision was made for taking the high-tension leads through the roof by means of a condenser type roof bushing.

In the generating station, the five alternating-current generators are each provided with two electrically-operated oil circuit-breakers, one of which connects the generator to the main 6,600 volt bus, while the other connects the generator to the 6,600 volt auxiliary bus, which is used to supply current to four transformer banks, each consisting of three 4,400 k.v.a. single-phase transformers. On the high-tension side of the step-up transformers, circuit-breakers are provided to make connections to the high-tension ring bus, which supplies the 115,000 volt feeders. The various 6,600 and 115,000 volt bus-bars are sectioned at various points by oil circuit-breakers and disconnecting switches. A water rheostat connects through a breaker to the 6,600 volt main bus in such a way that it can be used to load any machine.

The control desk for the generating station, Fig. 19, comprises a pipe frame work having mounted on it nine sections of marine finished slate, containing the various controllers, indicating lamps, etc. A separate instrument frame is furnished, supported by pillars from the control desk, containing the various meters required for the installation. The rear of the desk and instrument frame is made of expanded metal construction. The central section of the desk is four feet wide, while the remaining sections are each two feet, so that the total length of the board allowing, for the end pieces, is slightly over 20-ft.

All of the controllers and indicating lamps for the direct-current system are placed on the front of the desk, while the controllers and similar devices for the alternating-current circuits are located on the horizontal top slab of the desk. A complete miniature busbar system is placed on the desk to show the connections made by the various breakers ; red indicating lamps being connected into the miniature busbar system in such a manner that they light up when their particular breaker is closed. The miniature high-tension bus on the horizontal slab of the desk is nickel plated and the corresponding low-tension bus is finished in polished copper to make it easier to distinguish them. The miniature direct-current busbars are on the front part of the desk, and these are also copper finished, but their location suffices to distinguish them from the other busbars.

In the switchboard room adjacent to the control desk, there are installed three 12 drop annunciators. One annunciator is connected to the thermometer signal devices on the main power transformers, in such a manner that a drop will be actuated and the bell rung in case the temperature of any of the 12 main transformers exceeds a predetermined limit. The second 12 drop annunciator is used to indicate the cessation of the flow of cooling water for any of the 12 transformers. The third annunciator is used in connection with the lightning arresters in the two 115,000 volt circuits and the four 6,600 volt circuits, the drop being actuated and the bell rung in case of a discharge on any of these six arresters. This annunciator is provided with six additional drops to take care of future circuits.

The switchboard for the control of the four 200 k.w., 250 volt exciters and the field circuits of the six generators hes two panels for the field circuits of the generators each contain six two-pole solenoid operated field discharge switches used in pairs for connecting the field circuits of the generators to either of two sets of field busbars. These field switches are electrically interlocked in such a way that only one can be closed at a time. The four remaining panels, which control the armature circuits of the exciters, each contain two two-pole solenoid operated carbon break circuit breakers so arranged that any exciter can be connected to either of the two sets of busses, and the breakers are interlocked so that the exciter can only be connected to one bus at a time. On the two central panels of the board there are two two-pole single-throw knife switches for sectionalizing the two exciter busses.

In addition to the main control desk with its indicating instruments, a panelboard is furnished containing the various watthour meters, graphic recording meters and relays required for the various circuits. Calibrating receptacles are mounted on small slabs on the rear of this board to provide means for checking and testing the meters and relays. Similar equipment is furnished for the control desk.

The waterwheels of the Inawashiro generating station are on the side of the power house away from the incoming penstocks which pass under the electrical section of the station, while the generators are located on the side nearest the electrical part. Suitable cold air inlets are provided for each generator, and similar outlets are furnished for discharging the air from these machines outside the building.

The transmission lines, from the generating station at Lake Inawashiro to the receiving station near Tokyo, follow closely the main highway which parallels the railway. While there are a number of river crossings where special towers are used, ordinarily the standard towers are employed for the straight portions of the line. These towers measure 72-ft. 9-in. from the ground to the top cross-arm which carries the ground wires. The first cross-arm carrying power wires is 4-ft. 9-in. lower, the middle cross-arm for power wires is 10 feet below this, and the bottom cross-arm is 10 feet farther down or 48-ft. from the ground.

The ground wires, two top power wires and two bottom power wires are 19 feet, 6-in. apart horizontally, while the middle power wires are 23-ft. 6-in. apart. One power circuit is on each side of the main tower, the wires being in the form of a flattened triangle, the top and bottom wires being 20 feet apart, and the middle wire 2-ft. to one side of the vertical line joining top and bottom wires. The small house inside the tower is used as a telephone booth and a storage space for spare insulators.

The normal tower spacing is 550 feet and the longest span, that across the Tone River, is 1,530 feet, this span being supported on towers 220 feet high. The conductors on the normal portion of the line are seven strand copper, 200,000 circ. mil, the ground wires being $\frac{3}{8}$-in. steel cables. At the Tone River crossing, $\frac{5}{8}$-in. seven strand steel cables are employed, these being anchored at the end by three groups of eight section insulators connected in parallel. The normal suspension insulators are arranged seven in a string. The American porcelains originally supplied have nearly all been replaced by those of Japanese manufacture.

Japanese Imperial Government Railways

The government railways of Japan are laying plans for very extensive electrification along the main Tokaido line that joins the city of Tokyo to the city of Kobe approximately 350 miles away. The first part of the electrification to be undertaken will be from Tokyo to the mountain section near Mt. Fuji, and for this work 1,500 volt direct-current will be employed on the trolley.

The Singapore Water Supply Project

By Stephen G. Williams, M. Inst. C. E., Water Engineer of Singapore Municipality

THE first public reference to the possibility that Singapore town would need to go to the Johore mainland for its water supply, occurs in the report by Mr. Robert Peirce, M. INST. C.E. (then Municipal Engineer), made in 1904, upon the Kalang and Seletar Water Schemes. He there stated that upon the completion of the Kalang and Seletar Schemes, the water resources of Singapore Island would, for all practical purposes, be exhausted.

During the succeeding eight years, various waterworks were under construction, including the Kalang Scheme, but in the year 1912, Mr. Peirce visited the Pulai district in Johore, and also entered into negotiation with the government and the F.M.S. Railways for the provision of space for a large water main upon the iron bridge, which it was then proposed to construct across the Johore Straits.

In the following year 1923, Mr. Peirce received by correspondence information with regard to the water resources of the Sungei Lenggiu and the Sisik Bahru, both of them tributaries of the Johore River.

In the year 1919, government decided that communication across the Johore Straits should be by means of a granite causeway, and arrangements were made with them, and with the F.M.S. Railways, for the accommodation of a water main upon the causeway, and under its lock.

In September, 1920, the municipal commissioners, with the consent of the Johore government, decided to make a thorough investigation of the water resources of the southern portion of Johore State, and that work was entrusted to the writer.

It was hoped that water would be found at a sufficient elevation to be delivered into Singapore by gravity, without the need of pumping. Investigations were therefore in the first instance directed to the mountain ranges of Pulai to the west, and Muntahak to the north of Johore Bahru.

Pulai Explorations

Gunong Pulai is an isolated mountain, over 2,000 feet in height, rising out of the plain in the form of an irregular cone, with a base some 21 square miles in extent; its surface being broken up into many ridges and valleys, down which, in all directions, the streams descend as mountain torrents.

In the course of the exploration of the Pulai area, it was amazing to find, in most inaccessible places, traces of former occupation by Chinese pioneers, who had apparently ascended the valleys many years before in search of tin, or in the hope of finding suitable spots for the planting of gambier or pepper.

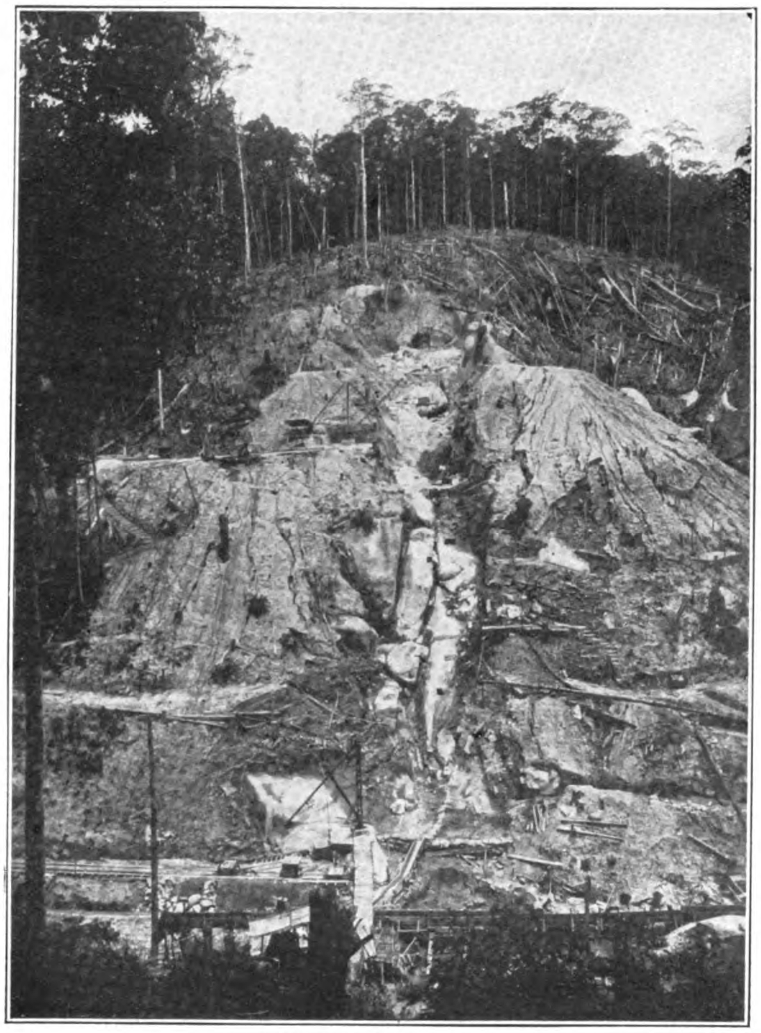
At the present time only the fringe of this mountain area is penetrated by natives usually engaged in collecting rotans and jungle produce. Until the time of our visit, the interior was unexplored except along one line where a pathway had once been opened up for Sultan Abu Bakar. This pathway, though long overgrown, could be traced here and there, having been occasionally used by trigonometrical survey parties visiting the summit of the mountain.

It was necessary first to cut access rentices through the virgin jungle in order to reach the water courses at the foot of the mountain, and then to traverse each water course to ascertain its volume, and the possibility of obtaining storage in its valley.

When the more important water courses had thus been located, survey work was undertaken, and stream gauges and rain gauges were established at suitable points. No former survey work had been done in this area.

Much help was obtained from managers of estates surrounding the mountain, and all available rainfall figures were collected from them. Rainfall and discharge figures were also obtained from Penang Hill, for comparison with the observations being made upon Pulai.

The study of the natural features and the geology of the district, and the establishment of reliable stream and rain records on so extensive an area, was necessarily a slow process.



PULAI II DAM SITE
Bedrock Granite Exposed Along Centre Line of Proposed Dam

One Practicable Mountain Site

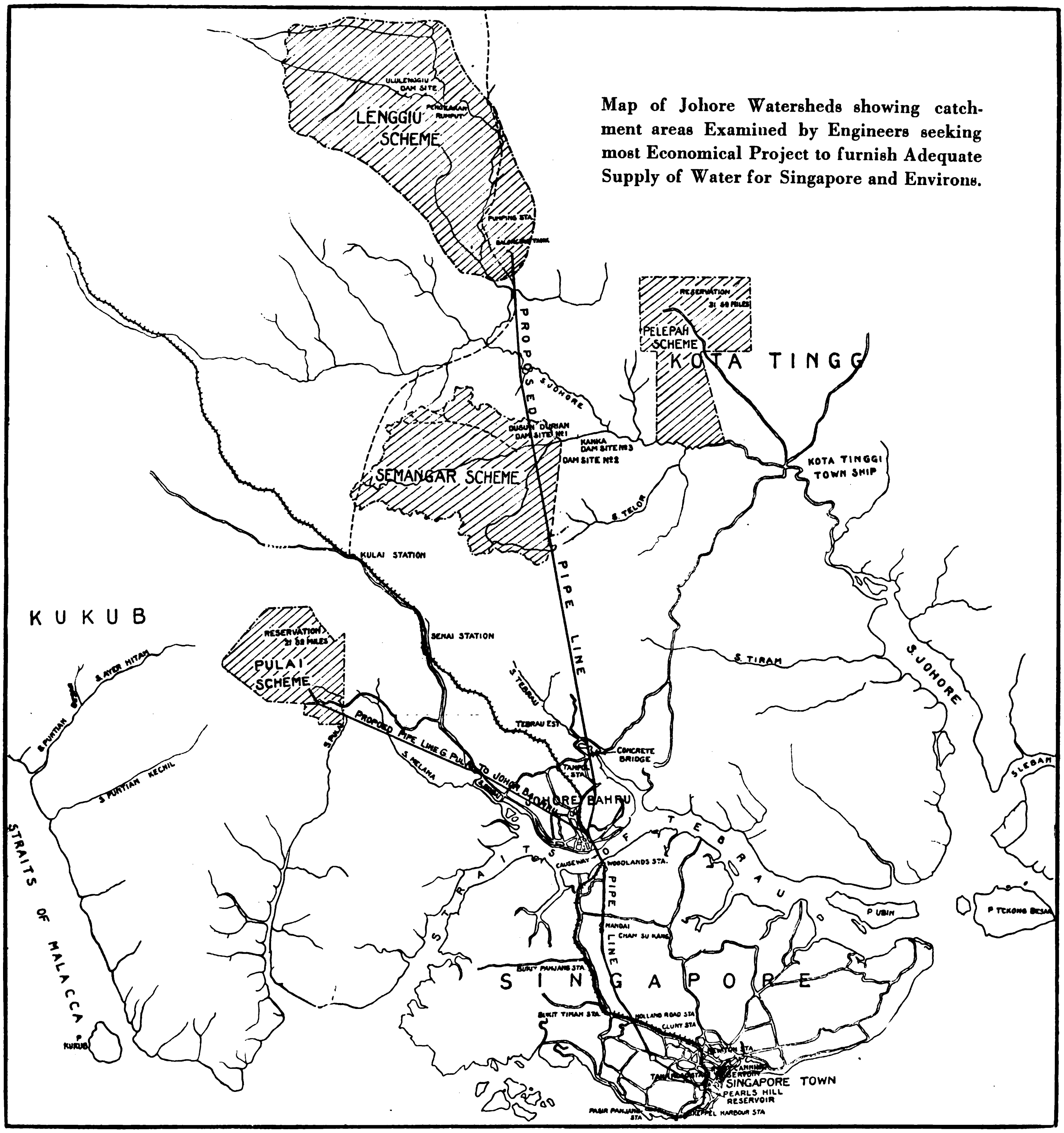
Preliminary reports were placed before the commissioners in 1920, 1921 and 1922, and the final report on September 1, 1922.

By this last date, it had been discovered that only one practicable site was available upon the mountain, suitable for the construction of an impounding reservoir, high enough in level to discharge by gravitation to Singapore, that site being on Sungei Pulai II, and combining the flows from the streams known as Pulai II and Pulai III. Any further supplies to be taken from Gunong Pulai would have to be obtained by pumping.

It was found also that the works necessary for developing the Pulai II Site would comprise a masonry dam across the Pulai II River, a subsidiary dam adjacent thereto, and an intake upon Pulai III River, with a tunnel to discharge the flow from that stream into Pulai II.

Borings had already been put down on the sites of these various works to ascertain the nature of the foundations available, and careful detail surveys of the sites were at once commenced for use in the preparation of the final designs.

At the site of the main dam on Pulai II, a trench was excavated across the valley on the line of the proposed dam. On one side of the valley solid granite foundation was found very near the surface. The other side of the valley, however, showed disintegrated granite soil, full of enormous core boulders extending to a very great depth. Excavation by ordinary methods was conducted until the depth of the trench, and the difficulty of dealing with the core boulders became prohibitive. An hydraulicing plant was then installed, and excavation was continued by washing out the earth surrounding the core boulders, thus loosening the boulders, which were then broken by blasting and removed from the trench.



Map of Johore Watersheds showing catchment areas Examined by Engineers seeking most Economical Project to furnish Adequate Supply of Water for Singapore and Environs.

This work presented great difficulties and occupied many months, but eventually it proved that a satisfactory foundation for a masonry dam could be obtained at a practicable depth. During this excavation work, the advice of the government geologists was sought from time to time, and they visited the works on several occasions, and reported thereon to the commissioners.

By September 1, 1922, when the final report upon Pulai was presented, the scheme had taken its final form, and a month later the Consulting Engineers, Messrs. Sir Alex. Binnie, Son and Deacon, visited the site and endorsed the proposals which had been put forward.

During 1923, further surveys, chiefly upon the lower lying, surrounding areas, were made, and the method of developing the later pumping instalments of the Pulai Scheme was settled.

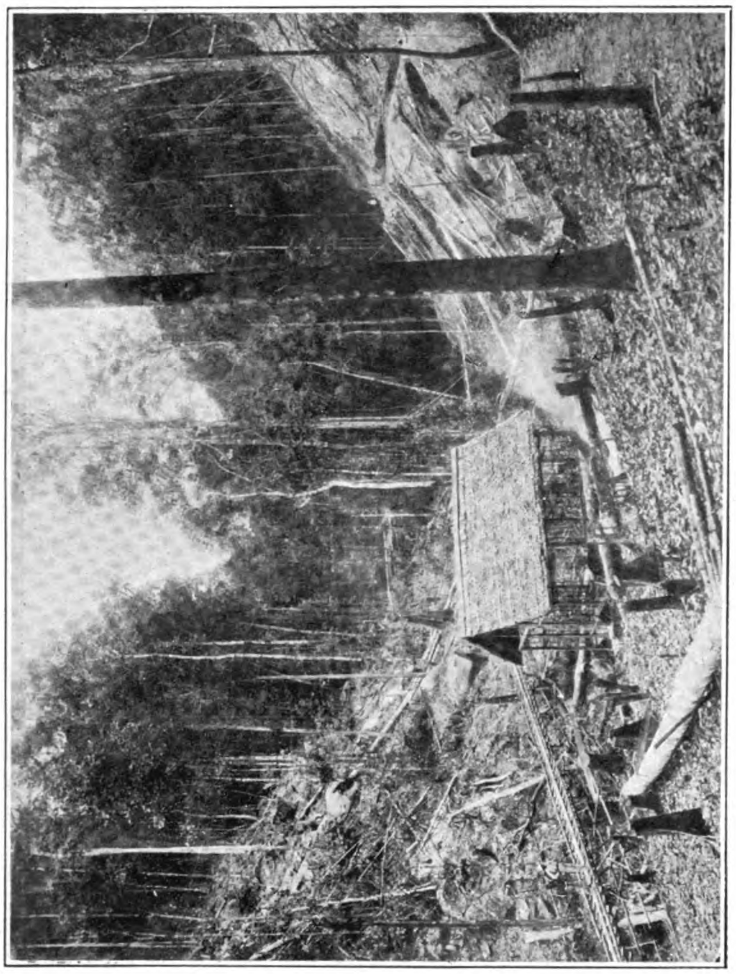
Many of the water courses on the mountain, though small in volume, are extremely beautiful. Speaking generally, they are steep and often flow through rocky gorges with many small waterfalls. In some cases, the valleys are so choked with enormous boulders that the streams are out of sight at a great depth below.

The highest waterfall found is on the Ayer Hitam which flows northwards off the mountain. It is 100 feet high and drops almost sheer down a granite face. At the top of this fall, on the smooth water worn granite, there exists a depression, which legend describes as an imprint of the foot of Buddha.

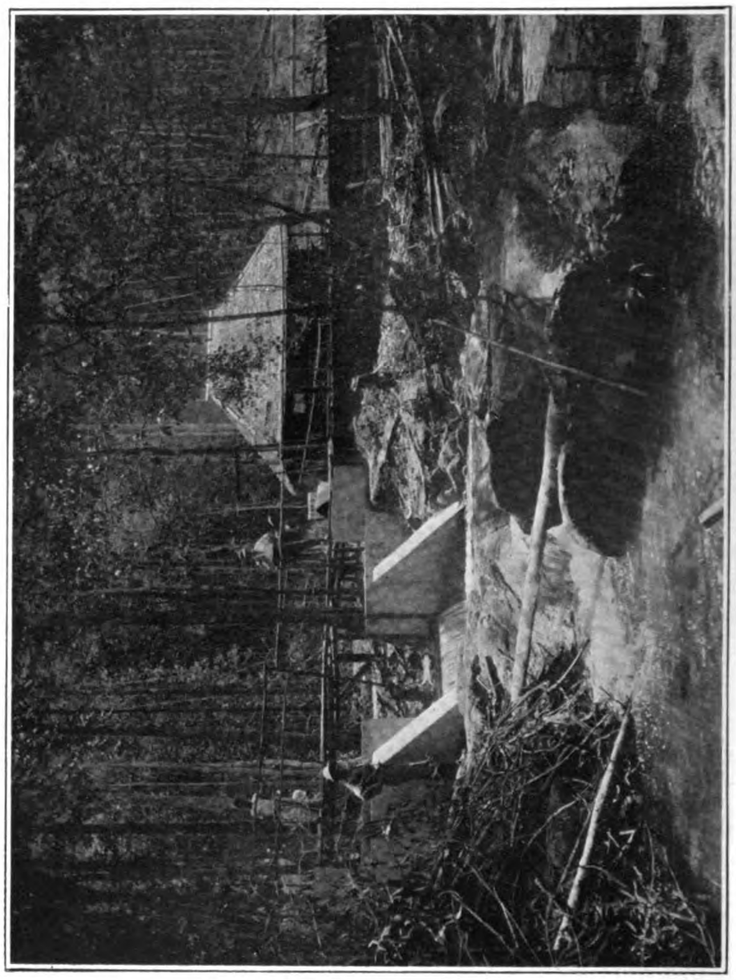
Pelepah Possibilities

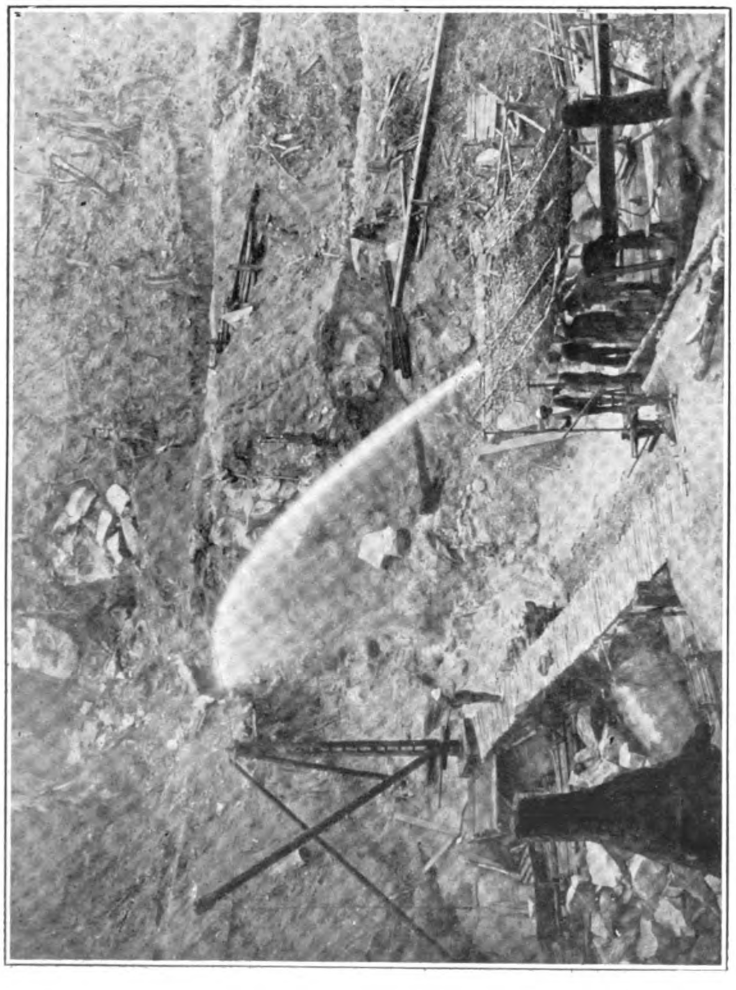
Simultaneously with the investigation of the Pulai area, an examination was made of the mountainous district around Gunong Muntahak.

RECONNAISSANCE OF PULAI RIVER TO GAUGE FLOW AND SELECT DAM SITE

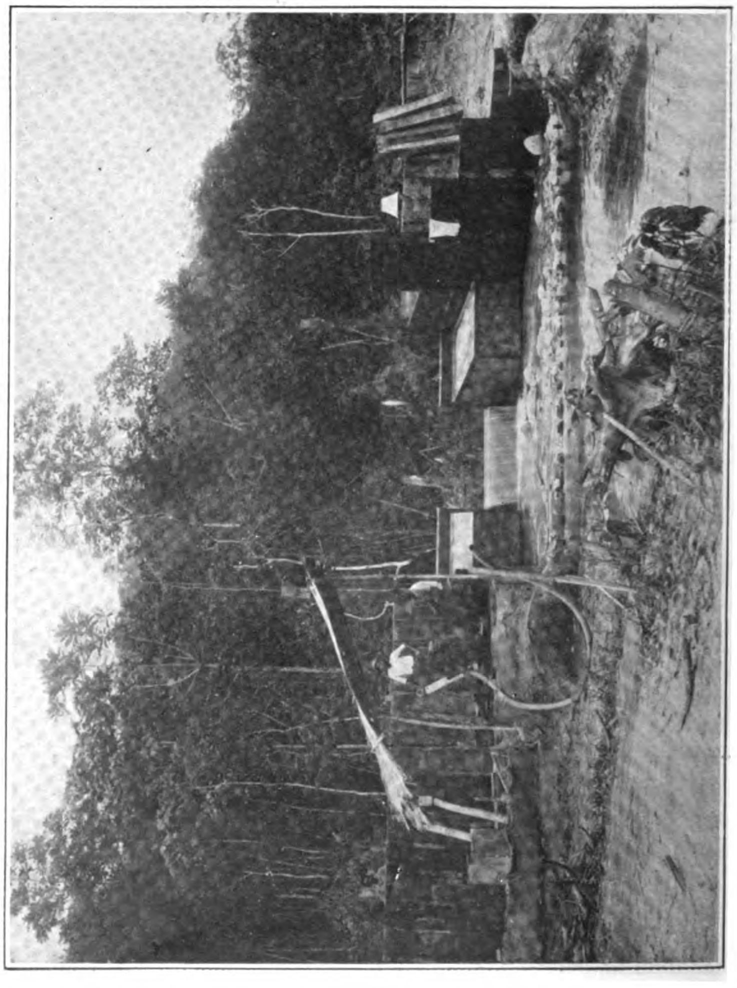


Pulai River Showing Site for Concrete Dam





Monitor at work, Washing Down to Bedrock



Two Stream Gauges Measuring Flow of Pulai River

The Sedili River, with its tributary, the Mawai, was examined, also the Lebak Valley. A visit was also paid to the Tengkil Valley, where the Tengkil and Middleton Tin Mines are situated. It was thought possible that works for water supply might be constructed in the Tengkil Valley in such a manner that they could be brought into operation about the time when the mining resources of the valley became exhausted. On investigation, however, it proved that the water resources of the valley were insufficient for our needs, and the distance from Singapore was too great.

At one period of the investigations, it was thought that this area would provide a scheme superior to that of Pulai, but when worked up it was found that the water supply which could be obtained, though ample in quantity, would have been too costly, as the distance from Singapore was greater and the whole quantity of water would have had to be pumped.

Some old surveys of this area were found in the Johore Survey Office, but they were not sufficient in extent or accuracy for our purposes, and the whole catchment contributing to the Pelepah River was resurveyed by us. A stream gauge and several rain gauges were also established on this area.

Johore River

Lenggiu River

Work in the Muntahak district then settled down to an investigation of the Pelepah River, which provided a most fascinating scheme.

It was found that the Pelepah River derived its water from two branches, the Pelepah Kanan and the Pelepah Kiri, both rising on the southern slopes of Gunong Muntahak. These two branches unite near the foot of the mountain, and flow through a basin of great extent, discharging through a gorge, whence the river flows through flat land to join the Johore River.

This area was found to be much easier of access than the Pulai area. It was opened up originally for tin mining by the Royal Johore and its associated companies, and though operations on a large scale have long ceased, a considerable amount of lampanning is still carried on there.

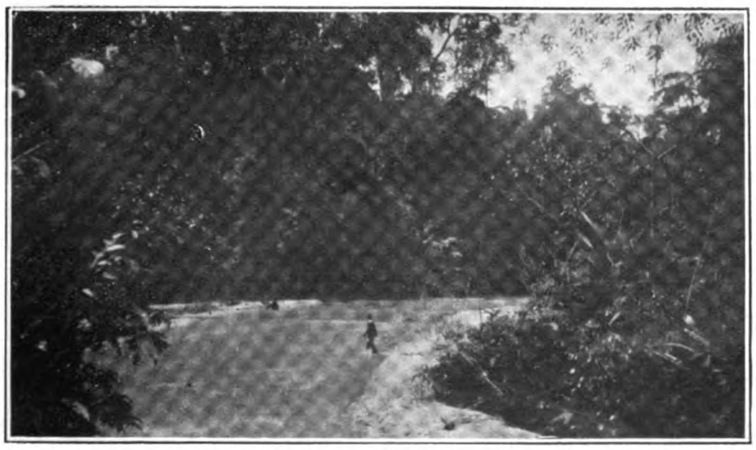
Both Pelepah Kanan and Pelepah Kiri are beautiful streams, and possess at a high elevation valleys suitable for damming; but it was considered that the quantity of water available in these two streams, if taken at the high elevations, would be insufficient to warrant the heavy expenditure which would have been involved, and that a more economical proposition would be to dam the main gorge below, thus flooding the large flat basin and creating a very great storage of water.

Waterfall on Pelepah River

The geological formation of this area is quartzite and sandstone, whereas that of the area investigated at Pulai is entirely granite, and it was anticipated that the comparison of the run-offs of these areas would have given valuable information. The early discontinuance of gauge reading in the Pelepah area has, however, made this interesting comparison impossible.

On account of the very large storage anticipated under the Pelepah Scheme, the possibility of utilising a portion of the water for the production of power was considered, but was not found to be practicable.

In connection with this scheme may be mentioned the ascent of Gunong Panti, a hill 1,500 feet in height, having a long flat top. There was a story current among the older native inhabitants of the neighbourhood that a lake existed at the top of this Gunong, from which the Sungei Lalang was fed. That story seemingly originated from the fact that the flat top, which is at a slightly lower elevation than the peak, is of the nature of a long narrow swamp, on which the tree and jungle growths are stunted. The results of the in-



Pelepah River

Sakai Village on Lenggiu River

vestigations in the Pelepah area were placed before the Consulting Engineers at the time of their visit in October, 1922.

At this time, October, 1922, two other schemes were mentioned to the Consulting Engineers, neither of which had then received detailed investigation. One was the Lenggiu Scheme for obtaining, direct from the River Lenggiu without impounding, a river supply to be pumped to Singapore. This scheme was considered worthy of further investigation. The other was the Skudai Scheme for taking the impure water of the Skudai near its estuary, and there establishing purifying works before pumping the water to Singapore. This scheme was considered unfavourable.

Investigate the Lenggiu

At the beginning of 1923, it was decided to investigate the whole of the Lenggiu area. The Sungei Lenggiu and its tributaries take their rise on the Blumut mountain range, distant some 43 miles from Johore Bahru. They drain altogether some 140 square miles of country, and discharge into the Johore River, a little south of Tengkil Tin Mine.

The highest points of the Blumut range are Blumut and Berchuak, twin peaks both over 3,000 feet in height, which dominate that part of Johore. They are entirely covered with dense jungle and their summits are usually enveloped in mist; in fact there exists, upon these peaks, vegetation which will only survive in a continuously moist atmosphere.

It is doubtful whether these peaks had been ascended more than once or twice by Europeans before our visit.

The whole of the Lenggiu drainage area is virgin jungle, broken only by some half dozen small Sakai clearings and one small mining lot (since abandoned).

The rivers are navigable for many miles by small Sakai boats which, in fact, constitute the most convenient mode of transport, being very light and easily lifted over the obstructions and sandbanks with which the rivers abound.

There is a charm about these rivers which leaves an indelible impression on the mind; the utter calm and peacefulness, broken only by the occasional cry of some denizen of the forest, the ever varying scenery, the rich tropical vegetation, the splash of colour here and there, where a mass of orchid or a fruit laden tree breaks the green monotone of the jungle.

Away from the streams all travelling must be done on foot. Elephant tracks are available in places, and there are Sakai tracks, which are however, difficult to find and follow without a guide. For the most part such journeys were done by cutting a way through the jungle.

To aid in obtaining a sound general idea of the country, a clearing was made on the summit of Bukit Chelinting, 1,500 feet high, from which the whole basin of the Lenggiu and its tributaries could be seen, nor will that view soon be forgotten, shewing as it did mile after mile of virgin country, untouched, unoccupied, rising gradually, ridge by ridge to the summit of Gunong Blumut.

The lines which were of importance to our investigation had to be located and surveyed a work of no small magnitude in such country.

It was found that none of the streams contributing to the Lenggiu could be tapped at a sufficient elevation to provide a gravitation supply, but many possibilities existed for utilising the very ample water resources of the district.

These possibilities were worked up and presented in the Lenggiu Report, dated July 17, 1923. They comprised the Lenggiu River Scheme, for taking the dry weather flow of the River Lenggiu; the Jengeli Scheme, for taking the dry weather flow of the Sungel Jengeli, adding to it as a later instalment the upper waters of the Lenggiu; and the Ulu Lenggiu Scheme, for taking the impounded flow of the Ulu Lenggiu, adding to it as a later instalment the flow of the Sungei Senteroh. These were all pumping schemes, and demanded, therefore, the most careful enquiry into pumping costs. In the course of these investigations, the resources of the Sungei Pengeli and Sungei Chenas were also examined, and reported upon.

Fortunately for us, we had, while working in this district, the opportunity of co-operating with the Government Geologist attached to Johore, and the combined topographical and geological information obtained in this area is undoubtedly a valuable addition to the records in the Johore Government Office. The conclusion arrived at, as a result of the Lenggiu investigations, was that the Lenggiu Scheme would be more costly than Pulai, but that it would provide a water supply adequate for an indefinitely long period.

Semangar Valley Considered

There remained still one area to be investigated, namely, the Semangar Valley, this area being much nearer to Johore Bahru than the Lenggiu area. The Semangar River takes its rise near Kulai on the F.M.S. Railway, and flows eastwards to join the Johore River, some 11 miles north of Kota Tinggi. When first examined, the Semangar River did not appear to be a very promising source of supply, but a study of its general location indicated that it must drain a very large valley. Surveys were, therefore, undertaken to ascertain the extent of this valley, which was found to be 50 square miles. It was obvious that the rainfall over an area of so great an extent, collected by impounding, would provide a very ample supply of water, and investigations were therefore continued.

The Semangar valley had formerly been partially opened up for pepper and gambier cultivation, but such cultivation has long since been discontinued, and the abandoned plantations were found to be thickly grown with blukar and resam, which proved even more impenetrable than virgin jungle, and the surveyors working in this area had a very hard task. They were, however, successful in completing their surveys, which included the location of dam sites, the making of trial borings, and the measurement of stream flow and rainfall. In this area also a hill top was cleared, for the purpose of obtaining a comprehensive view over the whole Semangar valley, and ascertaining its relation to the other schemes. Alternative proposals for the development of this area were then worked up, and presented in the Semangar Report dated November 24, 1923.

It was found that this area could be developed at a less cost than the Pulai area, and that its water when delivered in Singapore would ultimately be no more costly than Pulai water. Moreover, the supply available was very much greater than the ultimate supply from Pulai. It was, however, entirely a pumping scheme, and no part of its water could be delivered by gravitation. It also involved the construction of an impounding reservoir with a very large water spread. These conflicting considerations gave room for wide differences of opinion as to the relative merits of the two schemes. In connection with the Semangar investigations, the valley of the Tebrau was also examined, and its possibilities as a source of water supply were reported upon.

Consulting Engineers' Final Recommendation

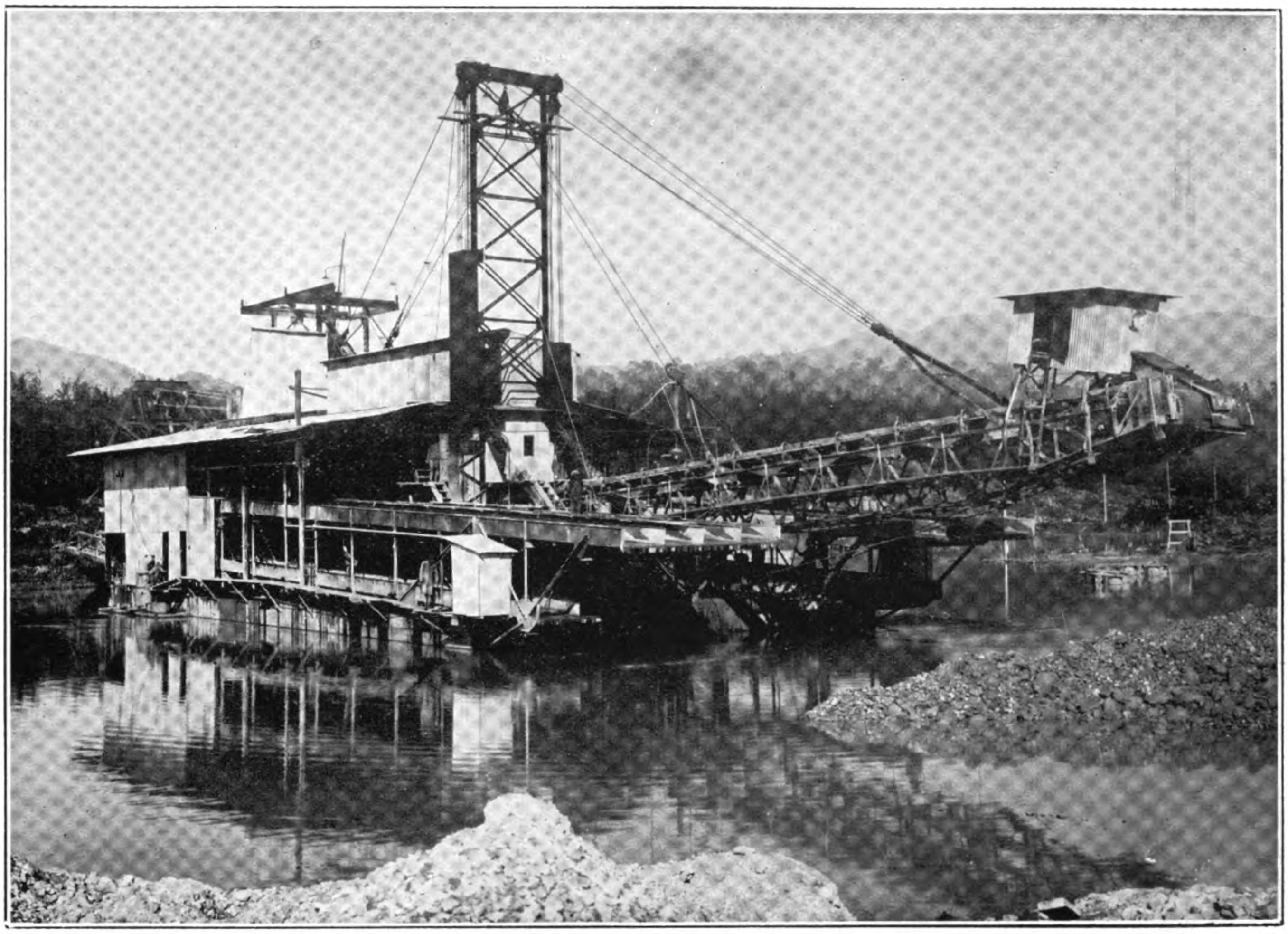
The Lenggiu and Semangar Reports were placed before the Consulting Engineers on their second visit in December, 1923. They visited Semangar and, while recognising the lower capital cost of that scheme, they considered that Pulai presented certain practical advantages (based chiefly upon its large high-level storage) sufficient to warrant its adoption in preference to any other scheme. They therefore, confirmed their formed recommendation that the Pulai Scheme should be adopted, and their recommendation was accepted by the Commissioners at a meeting on December 13, 1923.

Consideration had also to be given to the question of conduits for conveying the water from each selected source to Singapore. In this connection, pipelines were located across country, with due regard to questions of gradient for the transport of materials and men, and depots for the handling of materials during construction. On none of the routes had actual survey work been formerly carried out, and it was necessary to run many miles of survey lines and levels along the selected routes.

General Considerations

In connection with the investigation of the various sources of water supply, many samples of water were collected and submitted to analytical and bacteriological examinations. Enquiry was also made as to the health conditions in each district, the prevalence of fever, and the probable extent of the anti-malarial work which would be necessary if construction works were undertaken.

In the course of these investigations, reference was made to all sources of information in the Peninsula that could possibly have any bearing on our enquiry. Much useful information was obtained from the Government Hydraulic Department in Kuala Lumpur, on the subject of river discharges in relation to various geological formations; also from many mine and estate managers, who had kept stream and rain gaugings. Reference was also made to the railway department in cases where their survey work was adjacent to our own. An investigation of this magnitude embraces a wide range of subjects, and entails an immense amount of hard work on the part of both the outdoor and office staff, to whom, therefore, my thanks and the thanks of the community are due, and it is hoped that the results of their labors will be found not unworthy of the importance of the subject.



Tin Dredging in the F.M.S. Bucket Dredge on the Rawang Tin Mining Properties, at Rawang, Selangor

Tin Mining in the F.M.S.* —I.

Principal Mines and Occurrences of Tin Ore in South Perak

By J. B. Scrivenor, Geologist, F.M.S. Government

Ampang

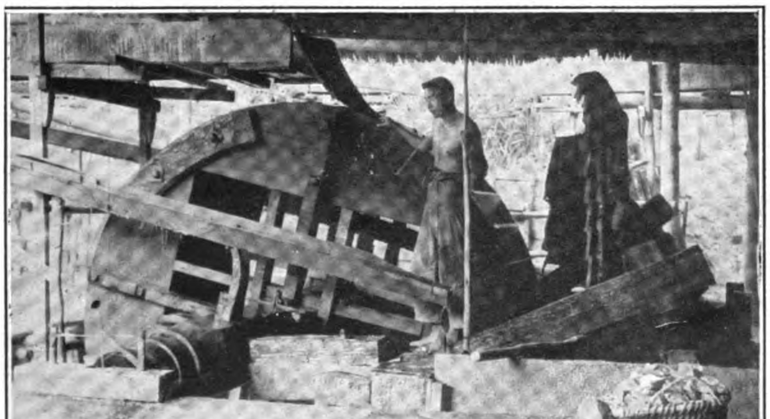
IN the Ampang tin-field, south of Tambun, there is not much to note. On the Ampang Tin Mining Co.'s property the bed-rock is partly dolomite and contains tin-ore *in situ* in small quantities. Some of the detrital ore about it is doubtless derived from this source.

Ampang is one of the few localities where corundum-boulders occur. They are not common. Towards Tambun weathered phyllites occur on high ground.

Bruseh

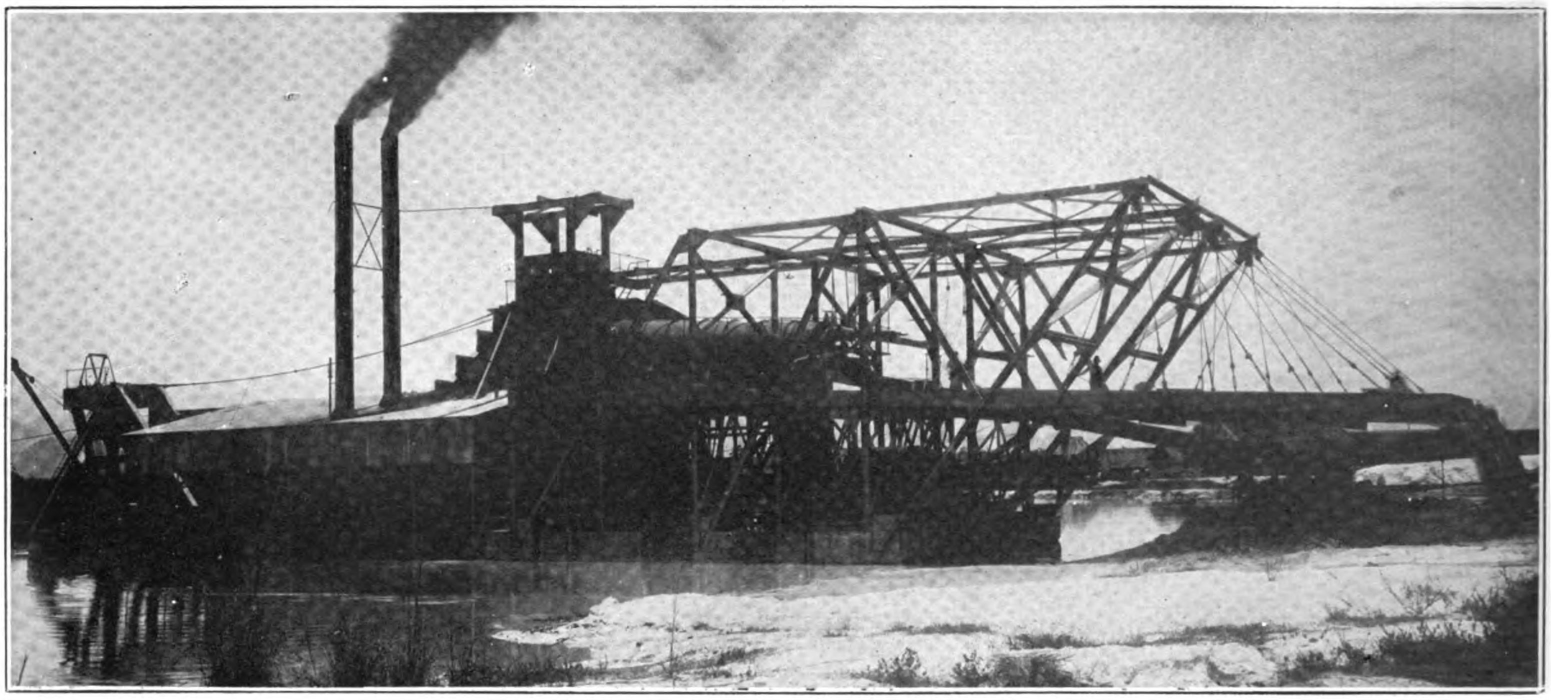
Bruseh is now a well-known locality on account of the operations of the Bruseh Hydraulic Tin Mines Co. Originally it was intended to work *tanah padi* only by means of monitors, but later it was found that the underlying rocks contained a *stockwerk* of tin-bearing veins, and although these were *in situ*, weathering had so affected the rocks that it was possible to cut the ground with the

* From the Report of the Geological Department, F.M.S. Government.



Water Wheel Stamp Used by Chinese for Pounding Tin Ore

Chinese Women Washing Alluvial Tin in Stream



Tin Dredge at Batu Gajah, F.M.S.

monitors and concentrate the tin-ore, as though detrital deposits were being dealt with.

On the east of the property is the granite of the main range, bordered by pegmatite and aplite rich in kaolin and sometimes carrying tin-ore. Schorl-rock also occurs, generally as intrusive veins into the older rocks. These latter, which are on the west of the granite, are sandy schists and clayey schists. The former abut on the granite and extend westwards for about 16 chains, dipping to the W.S.W., that is, under the clayey schists. It is difficult to determine what the clayey rocks were before they were weathered. At one spot the monitors reached fresh garnet-pyroxene-schist which indicates that they may have been complex in composition. The sandy schists are clearly altered sandstone. They have as a rule yielded more tin-ore than the other rocks, but it has often happened that a fresh face has had to be left a month or more to weather before the monitors could make any useful impression on it, working at 140-lb. pressure with a 3-in. nozzle.

Masses of ironstone (" laterite "), formed in the most weathered portions of the sedimentary rocks, give much trouble in the work. They are stacked and used as road-metal.

The tin-bearing veins, which are fissure-veins, are numerous and generally rich in tourmaline. This mineral extends for some inches from the fissure, the latter being in some rare cases almost completely filled with cassiterite over a portion of its length. An exceptional specimen showed a vein of cassiterite two inches thick and smaller veins of the same mineral branching off into the schists. The veins vary in thickness considerably, but an inch may be taken as a fair average. Generally speaking, they are parallel to each other, but it is not uncommon for one vein to split up into two or more smaller veins, and one section, which is, I believe, still standing, shows veins intersecting at an acute angle. Another system of veins, rich in quartz, but also carrying cassiterite, cuts the tourmaline-cassiterite veins.

The work at Bruseh now is much reduced compared to what it was prior to 1910, owing to the practical limit of work having been reached in the old workings, although the veins are still visible. An extension of the *stockwerk*, however, has been found to the north.

The average yield of the ground at Bruseh used to be estimated at ½ kati per cubic yard. A little wolfram occurs in the veins.

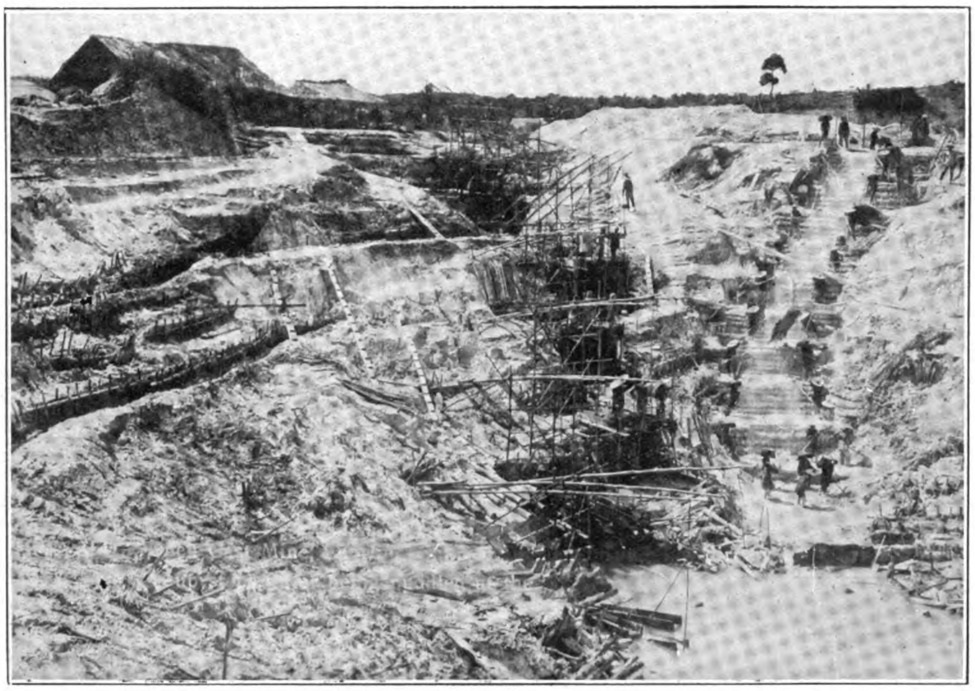
The Bruseh hydraulic property is an excellent example of a big *stockwerk* of tin-bearing veins in altered sedimentary rocks, and it also shows better than any other occurrence of tin-ore in the country to what a great extent the miner has been helped here by tropical weathering. Had the *stockwerk* been situated in a temperate climate very little ore could have been won from it profitably, once the soil had been passed.

Jeher

The mine worked near Tanjong Malim by the Jeher Hydraulic Tin Mining Co. is one of those in which operations have decreased in

Open-cast Tin Mine, Selangor

Open-cast Tin Mine at Tanjong Toa Allang



Open-cast Mine, showing Chinese Women Lift Pay Dirt by Bailing it up Steps after being Puddled at the Bottom

importance of late years. About 1907 the mine was at its best. The operations resembled in some respects those at Bruseh. It was known that Chinese had obtained quantities of tin-ore by shallow shafting above a certain line over the back of a low hill. Further examination proved that these shafts had been sunk along a band of soft sandstone and shale country traversed by numerous veins of quartz carrying coarse cassiterite. Monitors were employed and with the aid of blasting it was found possible to work down on the veins in an open-cut to about 40 feet below the surface of the bed-rock.

The band of country along which the veins occurred trended roughly east and west and the mass of veins was inclined from the perpendicular slightly to the south. The greatest thickness of the band was about 20 feet; its length about 1,000 feet.

In addition to the quartz-veins, other veins traversed the country-rock, such as veins of quartz, tourmaline, and muscovite, veins of mica, some being lepidolite, stringers of white mica with cassiterite and sometimes pyrite, and also veins of quartz and kaolin with long prisms of tourmaline.

A large amount of tin-bearing soil was worked on this hill.

Beyond Jeher, Mr. J. Tait has for a long time worked a mine close to the granite-junction. The country rock is sandstone and shale, the former being weathered quartzite. Soft kaolin-veins traverse these bedded-rocks and there is no doubt that they are the source of some of the tin won there. These kaolin-veins resemble those at Gĕlugor, Kĕrling in Sĕlangor, and those in Kinta.

Gopeng

Gopeng, together with Tekka and Jĕluntoh, can be regarded as a small tin-field by itself. It has been very prosperous for many years, and is of such interest geologically, that an adequate description of it requires more space than can be afforded here.

The Gopeng tin-field is divided into four parts. On the east is the stanniferous granite of the main range. To the west of the granite and in the centre of the tin-field is a stretch of high rolling ground trending westwards. To the north of this is the low-lying land of Tekka and Sungai Raia, and to the south the low-lying land drained by the Jĕluntoh and Kampar Rivers.

In the granite area a large island of phyllites and quartzites has been discovered and found to be impregnated with tin. The granite is in places traversed by numerous small veins carrying tin-ore that are worked by means of monitors.

The rolling ground in the centre of the field is higher nearer the granite than further west; and here we have exposed, in the Ulu Gopeng Mine, phyllites and quartzites impregnated with tin-ore from the granite.

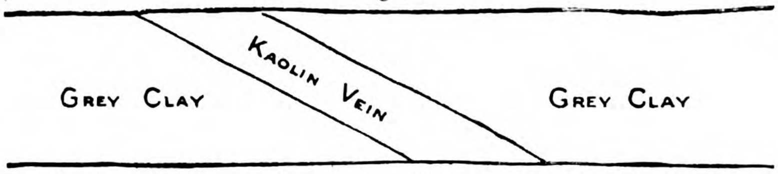
Going westward, and at the same time descending, the phyllites and quartzites give place to the clays and boulder-clays, on which are the big hydraulic mines belonging to Kinta Tin Mines, Ltd., and the Gopeng Consolidated Mines.

To the north the Tekka River has cut down into the clays and boulder-clays so that the low ground is composed of a comparatively thin cap of the clays above the limestone bed-rock. As one approaches Sungai Raia more hilly ground is encountered, formed of the clays and boulder-clays, worked by the Tekka Company and formerly by the Sungai Raia Tin Mining Company.

To the south a thin covering of clays is found over the limestone as on the north, but while on the north the clays abut on the granite, on the south there is a low range of tourmalinized sedimentary rocks between the outcrops of the clays and of the granite.

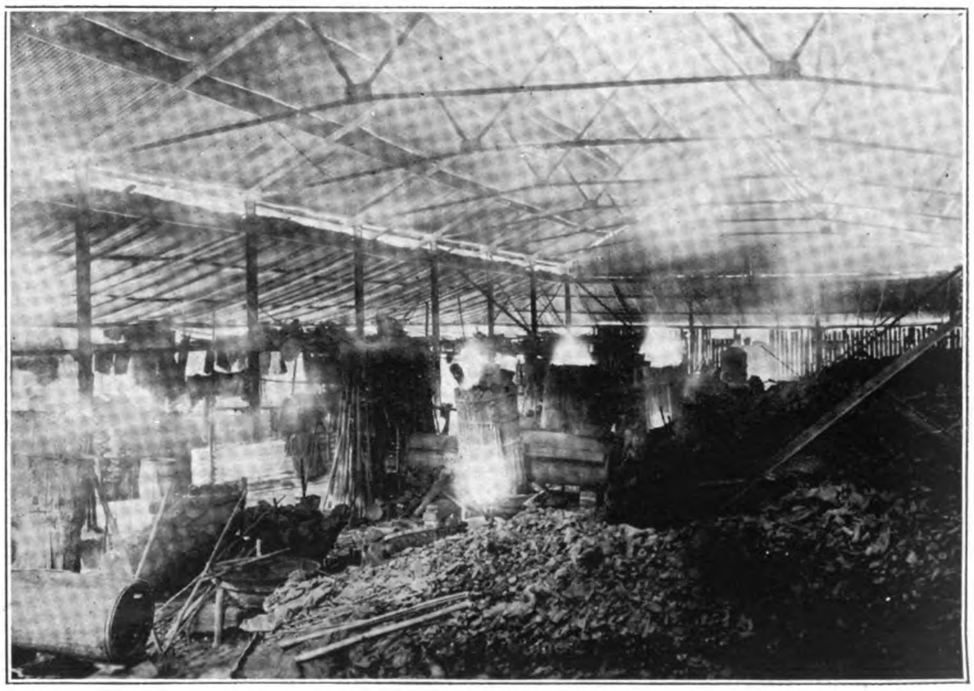
The most interesting ground in this neighborhood is that on which the big hydraulic operations are carried on. The extent of the sections in the clays and boulder-clays laid bare by the monitors would hardly be credited by those who have not had the good fortune to see them, while the effect of the powerful jets of water, that carry away all loose material, is to reveal with remarkable clearness the minute details of the detrital rocks, the veins from the granite, and the junction between the granite and the detrital rocks.

Fig. 14

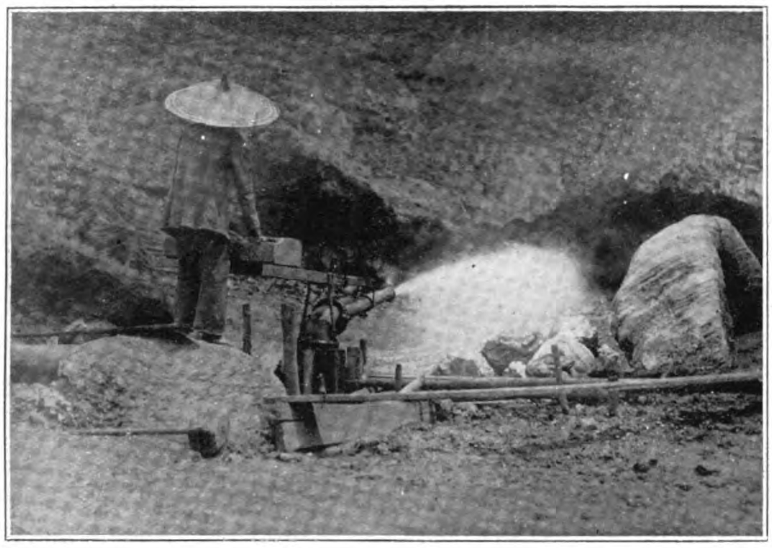


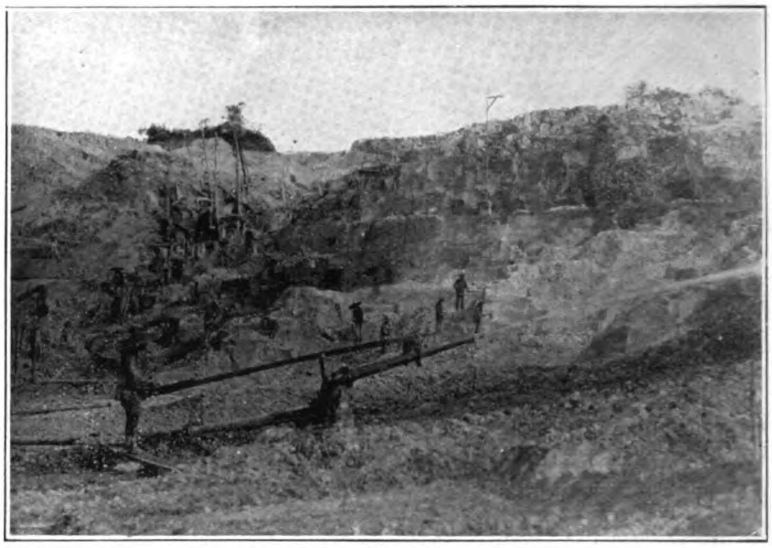
Section on Gopeng Consolidated Showing Relation of a Kaolin Vein with Lepidolite to the Grey Clay, June 1915

Fig. 14 is a sketch of a section of the Gopeng Consolidated land of a kaolin-vein cutting grey clay. Fig. 15 shows a band of rock composed of blue tourmaline and white mica bordering the kaolin-



Chinese Method of Smelting Tin Ore





Hydraulic Monitors at Work

vein where it is in contact with clay. This section was seen in a deep working close to and north of the Kota Baharu road.

The junction between the clays and the granite has been well exposed on the Tekka, Ltd., property and on a Chinese mine further to the south for a number of years. On the French mine at Tekka-clays are well exposed, and the new water-power supplied to these mines will give more information by laying bare sections deeper and at a quicker rate than was possible with the old installation.

Fig. 17 is a plan of part of the Tekka, Ltd., mine where the junction of clays and granite has been exposed for some months.

Fig. 15.

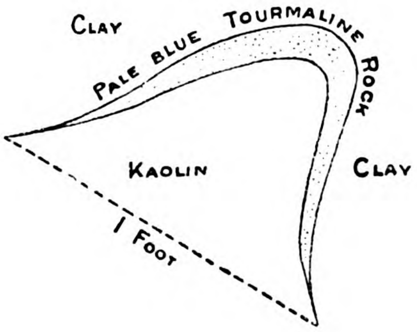
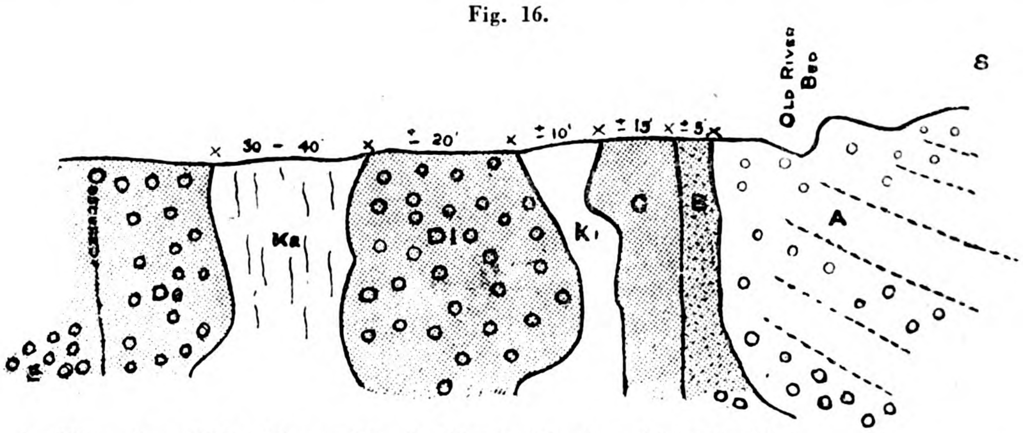
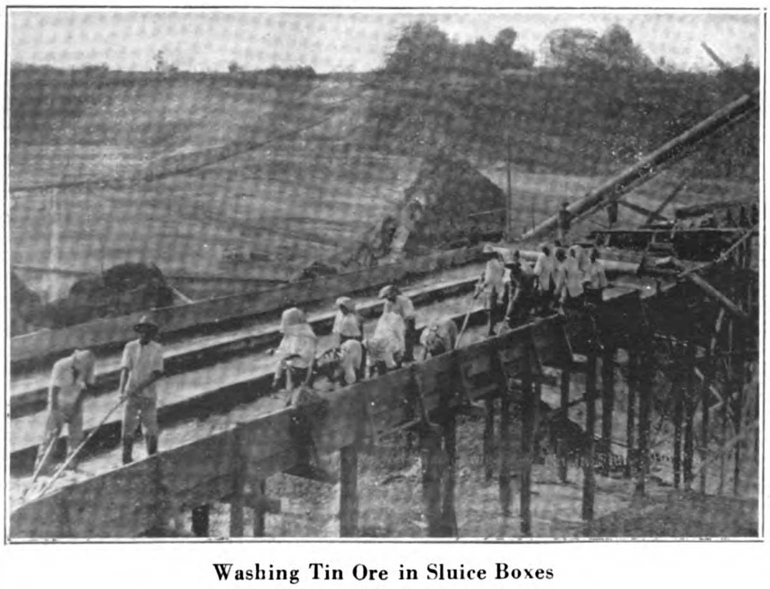


Fig. 16.

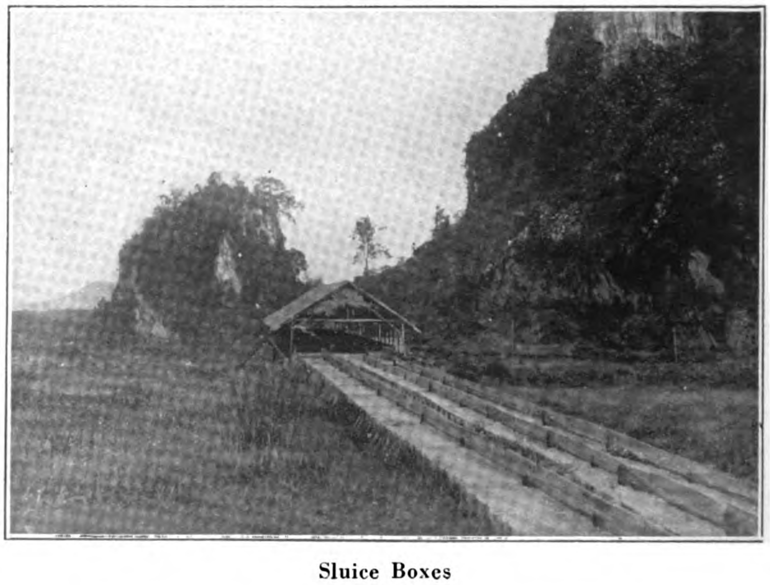


A=White clay with boulders and bands of hard white clay without boulders
B=Red and white mottled clay. Transitionary from A to C C=Red clay without boulders
D 1 & 2=Red clay with boulders E=Yellowish-red clay with boulders
K=White kaolin K2=White kaolin stained with thin bands of red

Sungai Raia, a good section showing the junction has been described in the *Geological Magazine* (1914, pp. 310-311). In the workings of the Gopeng Consolidated Company and the Kinta Tin Mines Company the kaolin-veins, limestone, clays, and boulder-When the sketch was made a monitor was situated near D, and the water flowed away from the face by a ditch indicated by the line A-E. This ditch was joined by another, between B and C. The line C marks part of the contact between clay and granite. In the



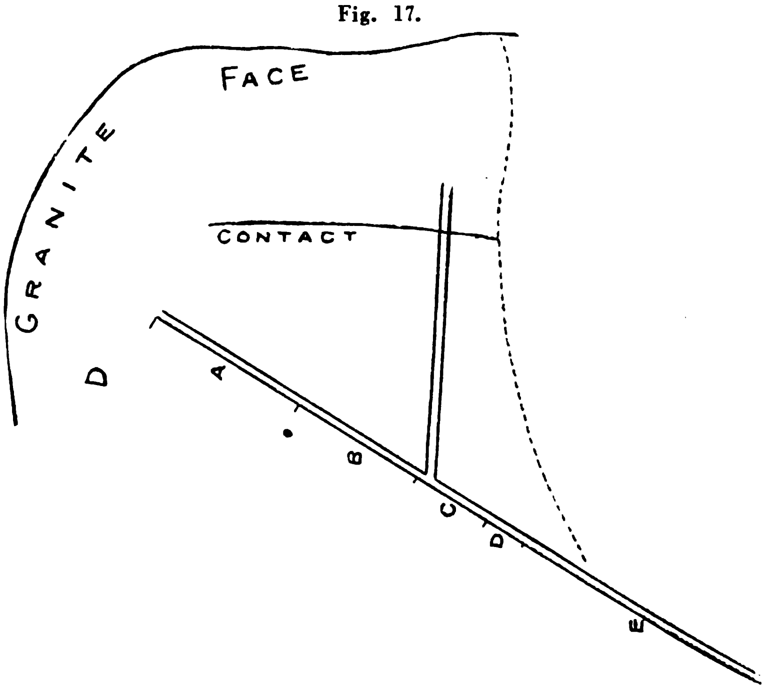
Washing Tin Ore in Sluice Boxes



Sluice Boxes

granite, to the right of the line, C, what appeared to be an included mass of clay was found. It was full of tourmaline. D is an altered mass of clay with mica-flourite-veins and tourmaline-veins. In the first part of the ditch, marked A, the clay is brightly-colored, streaky, contorted, and contains tourmaline-veins. shows part of this section. In the next part of the ditch, marked B, the veins and streaks are less pronounced and in the next, C, the veins are broken and fewer. Further on, at D, there are the remains of a few veins only, and from there onward clay with stones of quartz and quartz-tourmaline rock, etc., which are not portions of the veins in the other parts of the ditch. It is impossible to distinguish a line of demarcation between the clay with veins and the clay with boulders.

Fig. 17.



Above and resting on the altered mass of clay at D was a mass of the granite that had moved a little down the slope owing to soil-creep. The effect of the movement could be plainly seen. It contains weathered core-boulders of granite and kaolinized felspar crystals and the movement has just been enough to break veins of quartz and tourmaline.

There is little doubt that the soil with boulders above the clay on adjacent parts of the mine, and which is distinct from the underlying clay has been formed by soil-creep from this granite exposure.

The mine, commonly known as "Ulu Gopeng," behind the village of Gopeng, worked formerly by the Gopeng Tin Mining Co., and now by the Gopeng Consolidated Co., is of especial interest because on this property there are very good sections of the junction of granitic rocks rich in kaolin and hard phyllites, sandy phyllites that are evidently altered quartzite, and tourmaline-schist. The alteration extends a long way from the junction, indeed the sedimentary rocks do not seem to be more altered at the junction than many yards away from it.

The bedding of the sedimentary rocks is distinct and is inclined at a very high angle to the west. There are small contortions here and there. In the soil above the sedimentary rocks ferruginous and aluminous concretion, and also replacements of weathered rock preserving the structure, are abundant.

Tin-ore occurs in the granitic rocks and also in small veins cutting across the strike of the sedimentary rocks. Quartz-veins are abundant in the latter and reach six inches in thickness. From the hill on this property overlooking the village a good view is obtained of the rolling country between the east side of the valley and the Kinta River.

Lahat

The big opencast-cast mine at Lahat, worked by the Lahat Tin Mining Company, is the first, to show with any degree of clearness the relation of the Gondwana clays to the lignites and sands that form so marked a feature of the western side of the Kinta Valley. I have not sufficient data to justify a diagrammatic section of the mine and neighboring country owing to the impossibility of keeping pace with the development of every mine in the district, but information kindly supplied by a former manager, Mr. O. Dawbarn, and my own observations, show that the structure is in the main the same as in other mines where the lignites and sands appear.

On the west the mine is bounded by a hill of stanniferous granitic rocks. Lying up against these and dipping steeply eastward are stiff blue clays, with angular tin-ore, showing rough lamination and slickensides, that may be regarded certainly as Gondwana clays. Quartz-boulders occur. I have seen one section in which these clays descend vertically. Above the clays are a few thin seams of lignite and thick beds of stanniferous sands and clays. The tin-ore in the Gondwana clays is like that found at Pusing Baharu Siputeh ; but that found in the sands is, I am told, distinct from it. It may be derived in part, if not wholly, from the granitic rocks by denudation. The Lahat Mine differs perhaps from others in which the lignites and sands are well developed, in that the sands are relatively a more important source of tin-ore compared with the Gondwana clays.

Close to the blue Gondwana clays a section has been exposed showing an almost vertical bed of clay with pebbles and boulders, lying between light colored clays, that resembles some of the bedded deposits at Gopeng.

In December, 1914, limestone appeared in the bottom of the mine. Its dip was very steep to the E.N.E. There was an iron-capping and specimens of the limestone when dissolved away left a small residue containing quartz, white and brown micas, and green tourmaline. These are secondary minerals connected with the granite.

At the end of 1914 also, the granitic rocks exposed were rich in kaolin. Sometimes the kaolin contained quartz, sometime stringers of tourmaline. Much of the kaolin was of good quality, and pure white.

(To be continued).

Shanghai Municipal Electricity Plant

(Continued from page 382).

Whilst the 18,323-h.p. connected during the current year is not so great as in the previous year, it is indeed satisfactory to think that even with trade in its present state such increase can be recorded.

It might be worth while noting that the department has yet to reap the benefit of a large percentage of the plant recorded in this year's connections, as many consumers are still slowly building up their load owing to the depressed state of trade and general conditions.

The hired motors show a decrease in horse-power and numbers. The reason for this is largely due to the fact that consumers can now buy motors at cheaper prices than formerly, and they find it cheaper to buy rather than hire. The mills with hired motors installed continue to favor this method in preference to purchase, as the small decrease in horse-power shows.

The advantages of the three-phase alternating current motor for lift work in comparison with the direct current motor are at times overlooked when an order for such plant is being placed. Points to be considered are that a more reliable and cheaper motor can be installed, and that the rate for alternating current is approximately a third of the charge made for direct current.

Heating and Cooking

A satisfactory year has again to be recorded. The allowance made for the expected increase in hired radiators has sufficed to meet consumers' demands. A total of 3,076 radiators were connected at the end of December, of which 2,178 were hired from the department. This represents a load of 7,391-kilowatts.

The cooking apparatus connected during the year shows an increase of 104-kilowatts, the total connected load being 835-kilowatts, which makes a combined heating and cooking load of 8,216 kilowatts.

The major portion of the cooking apparatus connected this year is consumers' property, which would seem to indicate that the equipment is found reliable despite the bad usage it is sometimes subjected to by the native servant.

The Nanking Road showroom continues to be a source of assistance to consumers. A selection of electrical equipment for use in the home is displayed and explained, and advice given as to where purchases can be made.

The foreign staff at the end of the year numbered 153, and the Chinese staff 3,225. At the end of 1922 the figures were 159 and 3,163 respectively.

Chinese Turkestan

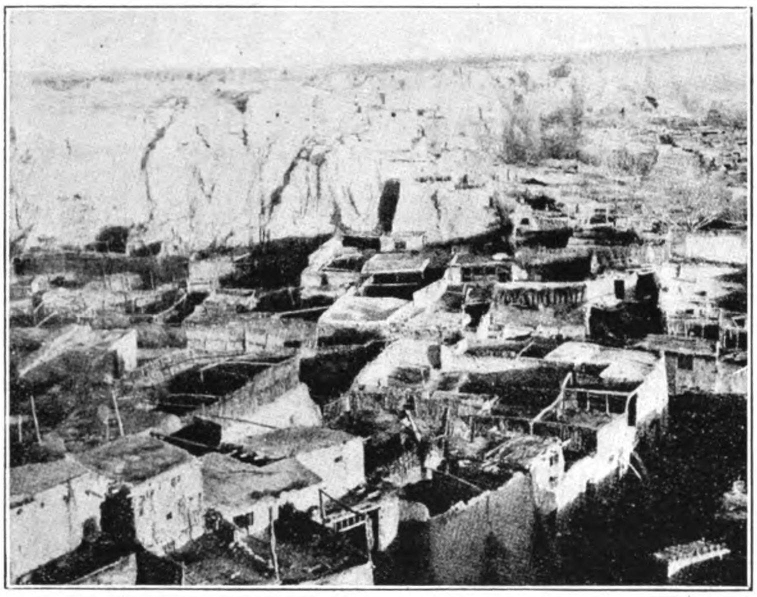
By Lieut.-Colonel P. T. Etherton

H.M. Consul-General in Chinese Turkestan; Author of "Across the Roof of the World"

CHINESE Turkestan, or the new dominion as it is known to the Chinese, forms an important part of the celestial empire, and in the following article I propose to deal with it from its various aspects, and to bring out its possibilities from a commercial and industrial standpoint.

It will be of interest to give briefly the geographical composition of Chinese Turkestan. It is bounded on the north by the Altai Mountains, on the east by the province of Kansu in China proper and the desert of Gobi in Mongolia, on the south by Thibet and the northern frontiers of India, whilst on the west we have Russian Turkestan and the Pamirs, more familiarly known as the "Roof of the World."

Speaking generally, the province is a land of oases, the arable parts being limited to the rivers and streams, and a narrow belt running along the foot-hills of the borderland separating Thibet and India from Chinese Turkestan. This belt is of no great width, but it marks the cultivable area, and is rendered fertile by the presence of rivers and streams which are brought to bear on the land by a system of irrigation worthy of explanation in detail. The rivers are first of all taken at the point where they issue from the mountains and divided into main streams, these in turn being split into canals and minor channels at the different villages and hamlets, whence the water is diverted on to the land. It will thus be seen that irrigation is the mainstay in the economic welfare of the country; the water question forms one of the leading features in the life of the people, and nothing gives rise to more frequent dispute and quarrel than the allocation of the water supply to the different parts of any given area.


The Sunken City of Aksu, Chinese Turkestan

The climate is the same as that of regions remote from the sea: in summer considerable heat, in winter corresponding cold. Humidity is almost nil, but a marked feature is the high wind prevailing in the spring with clouds of dust, enveloping the country in a haze that frequently takes several days to clear away.

The total amount at present under cultivation is about seven thousand square miles, a figure that could be very considerably increased if the Chinese were to adopt a scientific system of supply, such as we have in India and Egypt, so as to make all possible use of the water available. The amount of land suitable to cultivation is large, and could be expanded, with a resultant enhancement of trade and revenue. The distribution of the rural population is governed by the oases formed by the irrigation arrangements, and between and beyond them one finds large stretches of waterless country. This is particularly noticeable in the south in the vicinity of Khotan, famed for its buried cities and the ruins brought to light by the celebrated archæologist, Sir Aurel Stein, where one passes for several days through barren and arid country not yet made available to the cultivator.

The general features of the province present several interesting aspects, notably in the northern and central parts where the sandy tracts are less frequent, and the general physical formation of the land is a succession of low, narrow ranges of hills, the ground in the immediate vicinity being composed of sand and shingle which would not lend itself to cultivation however good the water supply might be. In the north, too, we find lakes, such as the Sairam Nor and the Ebi Nor, into which many of the streams flow, or not infrequently they lose themselves in the desert, as is the case in Seistan. In the southern part of the province we have large areas of ground covered with a saline deposit, but this brackish, salty soil is not confined to Kashgaria; it is met with all over the new dominion, salt impregnating the ground generally, and often cultivated fields present a snowy appearance from the amount of salt exuding from the soil.

From the above we see that the general geographical formation of Chinese Turkestan is a valley with an environment on the north, west, and south of high mountains. The depression itself is flat, with the exception of a range of hills known as Mazar Tagh, just north of Khotan, and an offshoot of the Thian Shan, near Karashahr, on the old Imperial road from Peking to Kashgar, known as the Kuruk Tagh. Although flat, Kashgaria itself is not low, but comprises a plateau varying from 2,700 feet above sea-level at Lake Lop to 4,277 feet at Kashgar. I have already indicated that the surrounding mountains pour many streams into this depression, the main river being the Tarim, on which Sven Hedin carried out a good deal of his exploration work. Beyond the Tarim lies the Takla Makan Desert, forming a great obstacle to any attempt to open the country from the east.

The bulk of the people are Turkis, a mixture of the original Iranian inhabitants of Central Asia the Tajiks, with their Turanian conquerors, the Usbegs. The Turkis are engaged in agriculture and commerce, and are Mohammedans of the Sunni order, many of them belonging to the Sufi sect. They are friendly to the foreigner, but show no marked desire for advancement or the development of their country.

The natural wealth of Chinese Turkestan is as yet unexploited, and herein lies a rich field for mining and commerical enterprise. Gold is found in the southern part of the province and in the mountains fringing the northern borders of Thibet. Copper is also much in evidence, coal is found at many points, whilst there are extensive deposits of ozokerit, or mineral wax, near Yarkand, and in the foot-hills of the Thian Shan, just north of Kuchar. Oil is also found near Kashgar, but the working monopoly is in the hands of the Tungan commander-in-chief, who exploits the wells on primitive lines, and commenced his development operations a few years ago under the auspices of a Swedish engineer who was a refugee from Russian territory. These oil-fields cover fairly extensive areas within fourteen days of the Russian railway, the oil and petrol being of proved quality.

The Chinese have not tapped the mineral resources, and would be unable to do so without the aid of foreign capital and enterprise, which they are chary of admitting from inherent dread of this leading to alien domination, and the ever-present belief that it is aiming at their sovereign rights. The opening out of the various mineral deposits would furnish material for export as well as supplying local requirements.

Of raw products, other than grain of all kinds, the principal are wool, cotton, and silk. The province could be made self-supporting, and the necessity of looking to the central government for a subsidy would disappear. It will interest merchants and others in

Europe and elsewhere to see some details of the silk industry of Khotan and its potentialities. Prior to the collapse of Russia, and the resultant cessation of trade with that country, the annual production of cocoons in Khotan amounted to well over a thousand tons. Since those prosperous days the production has fallen away to such an extent that it now only amounts to some 500 tons wet, giving an approximate yield of 165 tons of dried cocoons, this quantity producing about 38 tons of spun silk. Of this total about two-thirds are exported to India, the remainder being disposed of in the local market.

Notwithstanding the excellent quality of the silk, a defective method of reeling renders it of little use for the export trade, but this is a matter that up-to-date machinery and methods would readily overcome. There are three kinds of this spun silk, each rather coarse and irregular—*i.e.*, not spun with a given number of threads. The silk, however, leaves the "bassins" in regular threads, but the cost is high owing to the extra work required with such inadequate implements.

Another article that was formerly well known amongst the products of Chinese Turkestan is jade, but its general export and sale have fallen off in recent years, although there are extensive stretches of jade ground near Khotan; but the people are averse to disclosing them from the fear of being compelled to supply forced labour in the mines. In mediæval days the jade of Khotan was famed for its quality, and we know that jade implements were in use in Europe.

Agriculture may be considered the most important and widely spread industry, and the one on which the inhabitants depend for their existence, there being no import of foodstuffs from neighbouring states.

For the successful prosecution of trade and commerce the main essential is good arterial communication. Chinese Turkestan is deficient herein, the communications being on a par with the general administration of the province. Metalled roads do not exist, rough roads and tracks only are in evidence, and in the hills footpaths worn by sheep and goats.

The main trade route to India, with which country Chinese Turkestan has most of its commercial dealings, is from Yarkand to Leh in Ladakh, whence there is a direct road to Srinagar in Kashmir, and so to Rawal Pindi at railhead. It is thirty days' march from Yarkand to Leh by a road crossing some of the highest passes in the world, which, as a commercial route between two countries, is the loftiest in the universe. Owing to the great physical obstacles, trade is carried on at a considerable disadvantage, and every summer, during the period when the passes are open, a heavy mortality in baggage animals results. This is consequent on the high altitude, the desolate nature of the country traversed, devoid of grass or any kind of pasturage, and the different glaciers to be negotiated.

Of late years, the government of India has done much to mitigate the difficulties and hardships of this route by the construction of supply depôts for grain, the erection of caravanserais for the use of men and animals, and in generally assisting traders to overcome the natural difficulties confronting them. At points along the road improvements have been instituted and carried through with a view to rendering it easier, so that it is now very different from what it was a few years ago. The road will, however, never be an easy one for the reasons enumerated above.

Leh, the capital of Ladakh, has from time immemorial been the link between the commerce of Central Asia with India, and when Russian activities in Central Asia threatened to endanger this ancient connection, it was thought that the trade might cease with the extension of the Russian railway to Andijan in Russian Turkestan, some thirteen days' march from Kashgar, whence there is rail communication with Europe and the Near and Far East. This was a great and obvious advantage over the long and arduous journey from India. The construction of this railway provides a comparatively cheap and rapid means for dealing with the mineral and other products of Central Asia, and, with the establishment of a stable government, efforts will undoubtedly be made to tap this new and promising ground.

There is another and possibly cheaper method of communication, via the Black Sea to Batoum, thence by rail to Baku on the Caspian Sea, and across to Krasnovodsk, the starting-point for the Andijan railway.

Brief mention should be made of the potentialities of the cotton and jute industry of Chinese Turkestan. Both are of excellent quality, and could be turned into a thriving trade if exploited on scientific lines; for the soil, labour, and material are at hand to co-operate with exploratory enterprise.

Surveys have been made in a perfunctory way for the laying of a railway from railhead in China proper to Turkestan, and the proposed track has been selected as far as Urumchi, fifty-four day's march to the north-east of Kashgar, but beyond this nothing has been done.

With the resumption of normal conditions in Central Asia there will come a trade boom, and it is of interest to detail the articles which will command a good market:

Household utensils: all kinds.

Hardware: Axes, screw-drivers, hammers, locks, hooks, horse-shoes, chisels, files, saws, carpenters' and blacksmiths' tools, enamelled ware, lamps, heating stoves for coal, wood, and oil.

Ploughs, harrows, mowers, reapers, sickles, and threshers.

Dairy appliances and utensils.

Machinery for factories.

Foodstuffs: Groceries, salts, vermicelli, sago, tapioca, tea, proprietary articles, patent medicines, etc.

Articles of clothing: Boots and shoes, dress materials, cotton goods, blankets, underwear, etc.

Miscellaneous articles: Drugs, medicines, dyes, paper, stationery, and material for setting up printing presses.

The above list applies to both Russian and Chinese Turkestan; indeed, the larger demand will occur in Russian territory, where the population is more advanced, and where there is a higher standard of civilization and culture.

New Locomotive is Evolved by Ingersoll-Rand & G.E. Co.

A NEW type electric locomotive, using oil for its fuel, the first of its kind ever built in America, has been built jointly by the General Electric Company and the Ingersoll-Rand Company. This has been especially designed for switching service and will be given its first practical test by the New York Central in its freight yards at 11th Street, New York City. The power plant equipment consists of a 300 horse-power oil engine manufactured by the Ingersoll-Rand Company, directly connected to a 200 kilowatt general electric generator. The motive power consists of four-HM-840 motors, one geared to each of the four axles. The unit weigh 60 tons, all on the drivers.

The General Electric Company has had extensive experience during the last 15 years in the construction of self-propelled motor cars and locomotives using gasoline as fuel. About 90 equipments have been put into service during this period and most of them are still operating. In order to take advantage of a low priced fuel in the internal combustion engine an arrangement was made with the Ingersoll-Rand Company to build an engine designed for the use of fuel oil and having characteristics of speed and weight that would be suitable for a locomotive. The locomotive has been in use in the yards of the Ingersoll-Rand factory at Phillipsburg, N.J. for about four months.

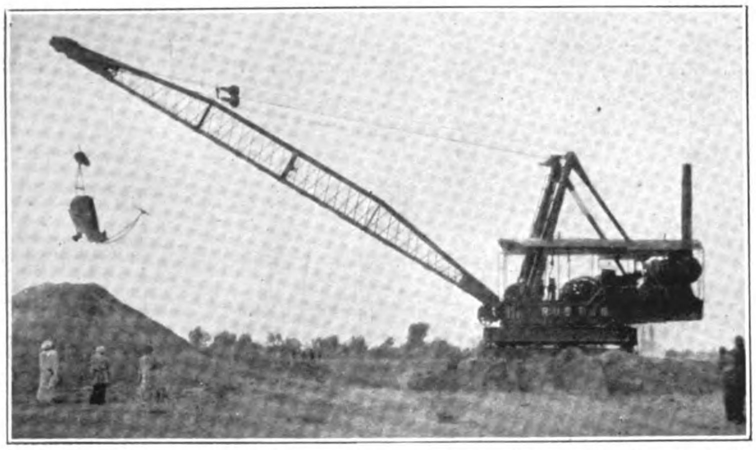
The Ingersoll-Rand unit is a six-cylinder engine designed to burn fuel oil and having the features of the well-known Price system of direct fuel injection. This system avoids the use of high pressure injection and also is said to make a reduction in weight, an improvement in mechanical efficiency and an increased simplicity and reliability. All parts of the cylinders, cylinder heads and combustion chambers are water cooled. The water from these water jackets passes to a radiator located on the roof and a thermostat maintains an even temperature regardless of weather conditions. Sufficient fuel can be carried for 48 hours continuous switching service.

Due to its high economy, (about 0.43 pounds of fuel oil per brake horse-power) the engine is free from smoke which renders it particularly suitable for service in cities or in places where smoke is objectionable. As ordinarily used in switching service, the 60 ton locomotive consumed about 20 to 26 cents worth of fuel oil per hour.

Progress in Large Excavating Machinery

THE largest excavator of the dragline type fitted with a jib 120 feet long and a bucket of 8 cubic yards capacity, was sent out to India in the summer of 1923 for the excavation of large irrigation canals in the Punjab. It was constructed by Messrs. Ruston & Hornsby, Ltd., of Lincoln, and was the largest excavator of the single bucket type ever constructedd Great Britain. It was of the full circle type, steam driven and the traveling gear was specially designed to allow the machine to travel over uneven ground without distorting the framing. This was accomplished by means of four bogies arranged upon a three-point suspension. The total weight of the machine was 285 tons, or about 320 tons in working order.

From reports to hand, the machine is giving great satisfaction, and has excavated over 3,000 cubic yards in a working day of 9 hours. A repeat order for a similar machine was received in October 1923; delivery was commenced two months later, and completed three months after receipt of the order, which was a practical test of the manufacturing facilities in the large new excavator works at Lincoln for the manufacture of excavating machinery. Repeat orders are the best recommendation a firm can receive, and six more of these large machines have been ordered for use in India. They are of a still heavier type than the first machine sent out. This is probably the largest single excavator order which has ever been placed for irrigation construction.

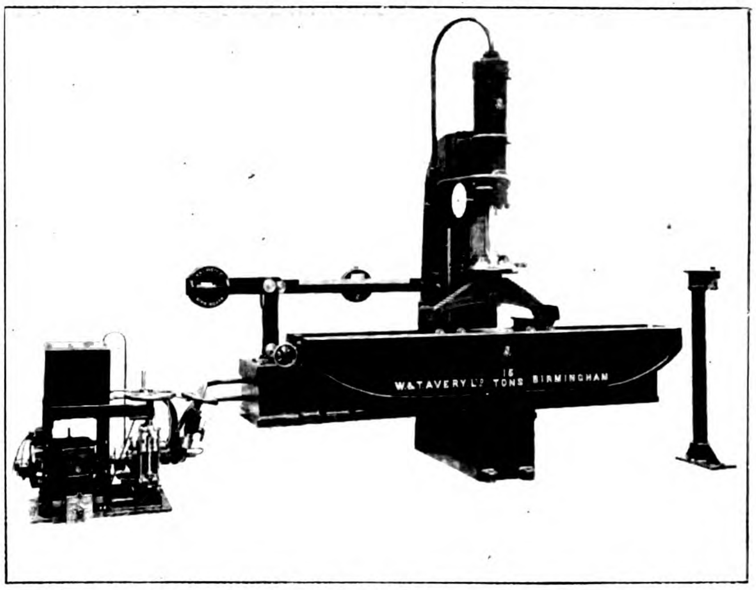


The dragline type of machine excavates below the level of the ground upon which it stands, in contradistinction to the usual steam-navvy or shovel type, which works upwards or only above the working level of the machine. The one, however, is readily convertible to the other by fitting either steam-navvy or dragline type of jib and bucket, as required. The largest machine of the steam-navvy type, weighing 300 tons and fitted with a jib 80 feet long carrying a bucket of 7½ cubic yards capacity, manufactured by Rushton and Hornsby, Ltd., is successfully removing cover from an ironstone quarry in Northamptonshire.

Another machine of the same size and type but electrically driven, is under construction for the excavation of a large deposit of brown coal in Australia. This deposit varies from 120 to 180 feet in thickness, and the working scope and radius of this large machine is such that from 60 to 70 feet of coal can be excavated in a single cut. In addition to the large machines mentioned above, Messrs. Ruston & Hornsby, Ltd., are manufacturing smaller machines weighing from 18 tons upwards, and at the present time have many on order of various sizes both for home and abroad.

Testing Machine for Railway Springs

THE heavy laminated and coil springs used on railway rolling stock are at present receiving special attention by railway engineers, on account of the increasingly heavy loads and rough usage to which present-day rolling stock is being subjected. Not only are the springs being tested for deflection under the loads they have to carry, in order to standardise the rate of the spring, but vibratory tests are also being applied to ensure that the springs are capable of withstanding suddenly applied loads. The machine shown in the illustration has been designed and manufactured by W. & T. Avery, Ltd., of Birmingham. The maximum loading capacity is 20-tons, but the same type of machine in varying capacities up to 40-tons has been constructed by this firm for spring makers



Two of these Machines have been Constructed to the order of the Egyptain Government for use at their Railway Depots

As will be gathered from the illustration, the machine consists of a weighing mechanism of the well-known "Avery" lever type, upon the table of which, the spring to be tested is placed. The pressure is then brought to bear upon the top of the spring, through the medium of a double acting hydraulic cylinder working with oil, the supply being derived from a motor driven hele-shaw pump unit. In using the machine the poise upon the steelyard is set to succeeding increments of load, and the hydraulic ram brought to bear upon the spring until the steelyard is balanced. The corresponding deflection of the spring for each load increment in then noted. Similar records are also made for the return stroke of the ram, and the results compared with the former figures. By this relation of the two series of figures, the internal friction of the spring can be ascertained.

In addition to the foregoing deflection test, the spring can be subjected to a vibratory test, and be compressed solid. This test will at once show if the spring has any tendency to take a permanent set, and also reveal any signs of brittleness due to shock. For the load-deflection test the pump is operated by a handwheel placed in a convenient position for the operator. Sustained loads can be maintained upon the spring by the use of a suitable valve.

The deflection of the spring under the applied load is shown upon the graduated scale attached to the main standard of the machine. A dial indicator is also supplied for showing automatically the compression of the spring.

Two four-wheel trolleys are provided, upon which the two ends of the laminated springs are seated, and a loose circular platen is also supplied for the purpose of testing coil springs.

Spring in tension can be tested by the provision of a separate standard which is bolted to the upper surface of the platform. The upper end of the spring is connected to a lug upon the standard, while the lower end of the spring is attached to the crosshead of the ram.

Mineral Developments in Burma

By H. H. Johnson, M.Inst.M.M., M.I.Mech.E.

A GOOD deal of interest has recently been aroused in the mining possibilities of a large zone of mineralized country in the southern Shan states, Burma. The notes herewith presented give some information as to this region of activity. They have been compiled as the result of several visits to the locality during the past two years.

Burma, as is well known, is one of the provinces of India, but it is separated from the main portion by the Bay of Bengal, the journey by sea between Calcutta and Rangoon, the capital of Burma, taking about 50 hours. From Rangoon the main line of railway runs north to Mandalay. From Thazi junction, a point on the main line 300 miles from Rangoon, there is a branch line known as the southern Shan states branch, which climbs up to the Shan states plateau to an elevation varying from 3,600-ft. to 4,400-ft., and terminates at Heho some 98 miles to the east of Thazi junction. Incidentally it may be mentioned that from Mandalay the railway swings north-east and climbs up to a similar elevation on the same uplands, there known as the northern Shan states, in which the great Bawdwin mines of the Burma corporation are situated. The two lines in the Shan states thus run roughly parallel to each other, and are separated by about 90 to 120 miles of rough and little known territory. On each of these lines there has been developed a popular hill station suitable for European settlement, the northern one being Maymyo, which is also the summer seat of Government, and the southern town Kalaw at an elevation of 4,200-ft. above sea level.

A mile or so east of Kalaw in the Southern States a good quality of coal has been found in limestone and shale formation, and a considerable amount of work has been done in an attempt to open it up commercially. Unfortunately the present indications are that the deposits are so uptilted, crushed, controted, and lenticulated that it is doubtful whether the coal will prove of economic value. This is the only true coal that has been found in Burma, although there are vast deposits of lignite in large and widely scattered areas. It had been hoped that the Kalaw coal would prove to be of great value to the province especially as it is of good coking quality, and coke has at present to be imported in large quantities and at high cost. Owing to its crushed nature the coal lends itself readily to washing and briquetting, and large scale tests of these briquettes have given excellent results as locomotive fuel.

An analysis of Kalaw briquettes gives the following results :— Fixed carbon, 58.0 per cent.; volatile matter, 30.92 per cent.; ash, 10.0 per cent.; moisture, 1.08 per cent.; calorific value, 13,910 B. T. U. This compares of course very favorably with the average Indian coal upon which Burma is now dependent, which has a calorific value of about 10,500 B. T. U.

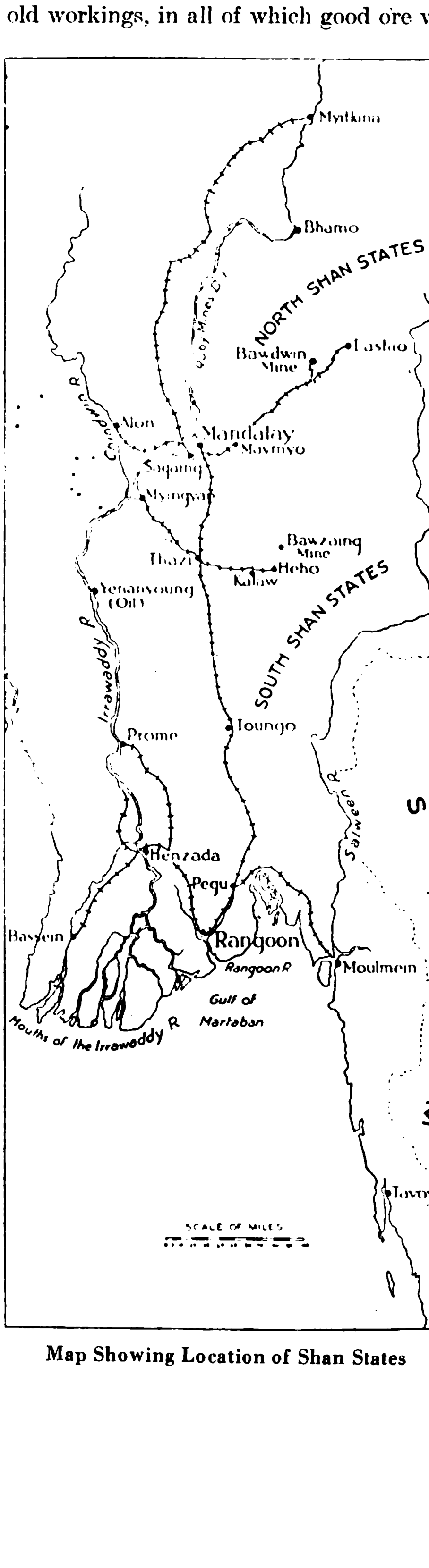
The advent for serious mining for coal attracted several engineers to the district, and perhaps in consequence of this, the large runs of old workings some 25 miles further east, from which samples of lead, copper, and other ores were frequently brought in by natives, received particular attention.

As regards the old silver-lead workings here, during the last two years or so large areas have been applied for under prospecting licences over a stretch of country about 8 miles wide and 30 miles long in the neighbourhood of Heho, on the railway about 25 miles east of Kalaw. This country generally consists of sedimentaries, limestones and shales predominating, with a very regular general north and south strike. Primitive mining for silver and lead is known to have been carried on in the Yaunghwe state, in which Heho is situated, for many years, possibly centuries, before the British occupation. The surface in many places is riddled with old workings, the custom having been for each family to burrow its own way into the ore, each resenting neighbors breaking through into his own mine. It is well-nigh impossible to enter these warrens today, but there is evidence that some of the workings were carried down to a vertical depth of over 200-ft.

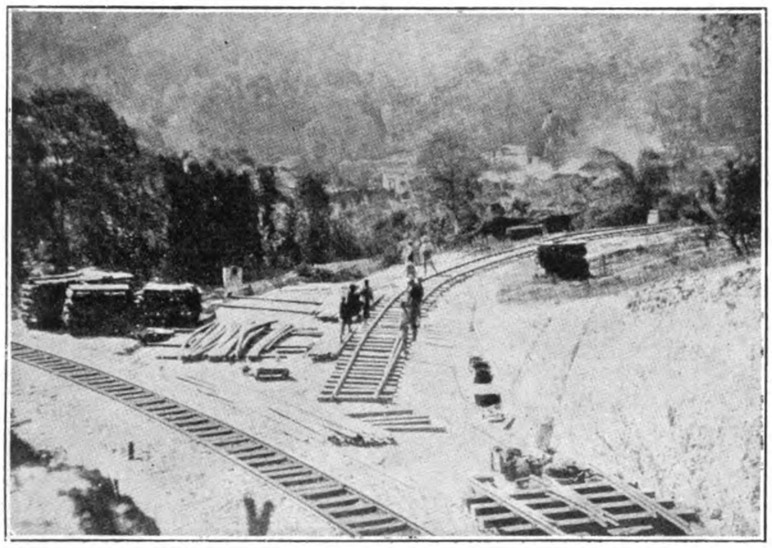
The lodes so far reopened are stockworks, consisting generally of limestone boulders much corroded, around which run veins of practically pure galena bedded in a reddish plastic clay. The system of the ancient workers was clearly to follow the clay and galena, leaving behind the boulders which were too hard or large to extract.

A well-known firm of Rangoon merchants has begun extensive prospecting and development work under the superintendence of Messrs. John Taylor and Sons, and several shafts are now being sunk, some 16 miles north of the railway in fine open undulating country.

The Shan states Silver-Lead Corporation, Ltd., has taken over the interests of the Kalaw Mining Syndicate, and is concentrating its energies for the moment on opening up a very promising area known as the Bawzaing mine, about 18 miles north of Heho, and about 2 miles from the before-mentioned operations. At Bawzaing a two-compartment vertical shaft has been sunk 275-ft. For about 100-ft. it passed through old workings, in all of which good ore was found, and it has now proved two lodes separated by about 10 to 20-ft. of limestone, the aggregate width of which without partings is just under 90-ft. The original syndicate put up a small washing and jigging plant to treat ore received from development, from the proceeds of which they were able to pay expenses. The first shipment of 11 tons of concentrates assayed: Pb, 72.0 per cent.; Ag, 25 oz.; Cu, trace ; Zn, Nil; As 0.05 per cent.; Fe 0.93 per cent.; Si, 1.2 per cent.; CaO, 9.8 per cent. The next shipment of 22 tons also assayed 72 per cent. lead and 20 oz. silver. Production has been stopped now for a few months to enable a permanent water supply to be provided, and to allow development to be pushed as fast as possible. Stations and cross-cuts have been made at the 120 and 200-ft. levels, the latter being in over 68-ft. in excellent ore. It is too early yet to place a definite value on the ore met with so far, but as a conservative estimate it appears that these lodes average 12 per cent. lead and about 3 oz. of silver per ton. The striking feature of the ore is its freedom from troublesome complications, and the extraordinary facility



Map Showing Location of Shan States



First Railway Siding to the New Mining Area

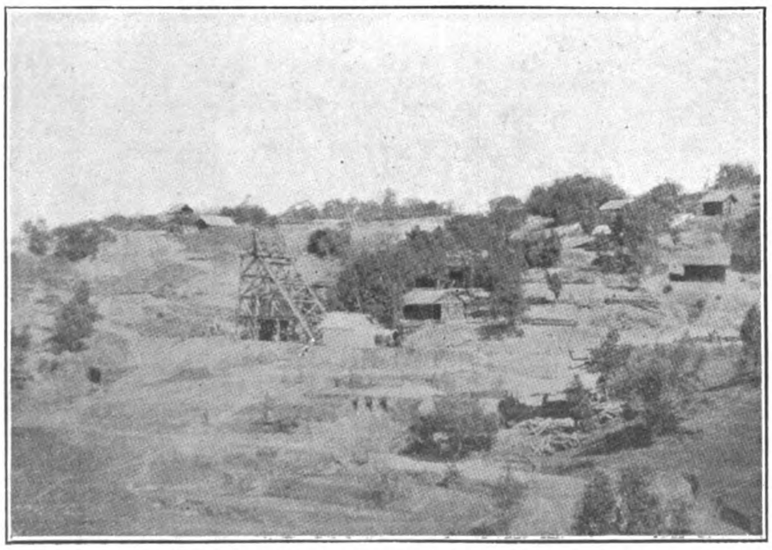
with which it lends itself to mining and concentrating by the simplest methods. Very little lateral work underground has been done so far, as all efforts are being directed to getting well down under the old workings and thus proving the deposit in depth.

So far as surface indications go there are several areas with all the appearances of the Bawzaing area which are awaiting development, and some even more favorably situated in relation to the railway.

Within the last few months a very interesting discovery of copper has been made within a mile of Heho station. Four lodes have been traced on the surface and by old workings for several hundred yards, with widths varying from 11-ft. to 25-ft. Samples of these outcrops show much weathered quartz and limestone impregnated with malachite and azurite, changing in a few feet of depth to bornite or chalcocite. These samples assayed for copper vary as follows: Main lode, 8.49 per cent.; ditto, 13.36 per cent.; ditto, 19.07 per cent.; east lode, 4.34 per cent.; No. 2 lode, 4.29 per cent. An analysis of the sulphide ore gives the following results: —Ag, 37.5 oz.; Au, 0.07 oz.; Pb, 0.20 per cent.; As, 0.05 per cent.; Sb, 4.0 per cent.; Fe, 5.0 per cent.; Zn, 0.5 per cent.; Co and Mn, 0.5 per cent.; Bi, Nil; Si, 46.0 per cent. Further work is being immediately undertaken on this property.

Within three miles of Heho and the copper area there is a fine natural waterfall of 777-ft. vertical in a horizontal distance of 4,000-ft. capable of developing at the end of the dry season upwards of 3,700 h.p., and steps are already being taken to develop this as the mining requirements may warrant.

For a new field, mining conditions are singularly good. At an average of about 4,000-ft. the climate is almost ideal for Europeans, and there is very little malaria. Rainfall varies from 40-in. to 60-in. between May and November. Fair supplies of mining timber are available, though the country generally is open rolling land with ridges of hills. Native villages are scattered, but there is a fair supply of mixed Shan, Chinese, Burmese, and Indian labor



The Kalaw Coal Mine— Southern Shan States

and as much as may be needed may readily be attracted under good conditions at about 30s. per month and rations. The mining laws are practically the same as those throughout India, and are fairly and ably administered. Railway facilities—within 400 miles of Rangoon—are good already, and no doubt these will readily be extended as required, for the country presents no difficulty. Roads for country carts are available almost everywhere, and during the dry weather motor-cars can generally be used, but the main tracks require metalling and it is understood that the government is already moving in the matter. There is thus every reason to expect rapid development on the field, and certainly the attractions for the expenditure of a moderate amount of capital in many directions are very great. It is certain that much more will be heard of this locality shortly.—*The Mining Magazine.*

Oil in New Guinea

Whilst all local reports of the discovery of oil are subject to reserve, the prospecting party organized by the Mandated Development Company is extremely optimistic regarding recent finds in German New Guinea. Members of the party who have returned to Sydney state that the company selected an area stretching along the northern coastline of the mainland of New Guinea to the Sepik River, including the authenticated Seepamees, and also the site selected by Dr. Schlenzig, the German geologist, in 1913. Boring commenced in May, and gas indications of oil soon appeared. The bore was carried to a depth of 70-ft. and the flow continued until 40 gallons daily were obtained. Fifty gallons have been brought to Sydney. Meanwhile, Mr. Spencer, the leader of the expedition, has, in a wireless message, expressed the opinion that an oilfield of commercial importance has been discovered. Mr. Ross, who was formerly engaged in the operations of the Anglo-Persian Company in Papua, and who has had 25 years' experience of American oilfields, states that he could not say that America has anything to equal the possibilities of the area, and that it is unquestionable that the oil struck must be backed by tremendous volume at a greater depth. The site of the bore is 54 miles from Aitape, in Northern New Guinea.

SULZER BROTHERS

SHANGHAI ENGINEERING OFFICE
No. 4 AVE. EDWARD VII

蘇爾壽工程事務所
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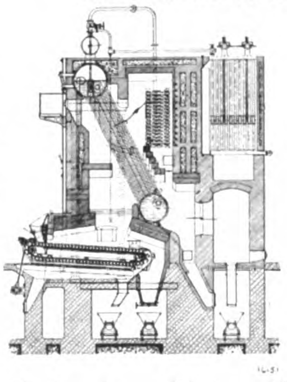

Section through single bank boiler with mechanical stoker economiser, etc.

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Engineering and Industrial Notes

BRIDGES

RAILWAY NEEDS BRIDGES.—Replying to a telegram from Marshal Wu Pei-fu inquiring as to the loss of the government railways due to the floods, it is reported that the ministry of communications has given the figure of $2,400,000 for the Peking-Hankow and Peking-Suiyuan lines. Because of the eighty breaks, and the destruction of five large and two small steel bridges the Peking-Hankow Railway suffered a loss of two million dollars.

BRIDGES ON KIAO-TSI RAILWAY.—The Kiaochow-Tsinan railway administration has concluded agreements with the successful bidder, a German firm, for the construction of a bridge at Lokow, Shantung province, and other bridges along the railway line. Work started August 1.

STEEL BRIDGE ON KIN-HAN LINE.—The ministry of communications has ordered the Peking-Hankow railway administration to invite tenders for a steel bridge to be built at Sinlo, Chihli province, south of the site of the former stone bridge, to replace the temporary wooden bridge. It is to be 60 metres long with eight arches. Its foundation is to be sunk 20 metres below the river bed. The cost of construction is estimated at $1,500,000. After completion, the present steel bridge on the north will be reconstructed so as to form a straight line with the new bridge.

BUILDINGS

YOKOHAMA SPENDING SIXTY MILLIONS.—The Yokohama municipal office has mapped out plans of rehabilitation of the port at an estimate of Y.60,000,000 to be obtained from the Japanese authorities in the form of a long-term loan. In addition, the Yokohama branch of the Tokyo rehabilitation office with Y.50,000,000 will undertake the construction of 21 iron bridges and other works which are of such character as to be carried out by the central authorities. Of the above estimate, Y.3,000,000 each, is allotted for the rehabilitation of a waterworks system and the gas enterprise, Y.8,500,000 for the rehabilitation of electric business, Y.6,188,000 for the widening and repairing of roads, Y.4,179,000 for the adjustment of lands, Y.6,000,000 for the repairing and dredging of rivers and canals, Y.1,250,000 for the construction of sewerage system, Y.3,750,000 for the repairing of the Yokohama memorial hall and Y.1,100,000 for the construction and repairing of parks, of which Y.800,000 will be spent on the reconstruction of the Yokohama park and the balance for enlarging Kamonyama park and creating a new park along the bund at Yamashita-cho which was reclaimed to the extent of some 100 feet in width. The above works will be started early next month.

NEW BUILDINGS IN TOKYO.—A new seven-story office building to be known as Mitsubishi No. 28 is to be erected by the Mitsubishi Company on the site of the wooden barracks from which the Yokohama Specie Bank recently removed. The new building will cost Y.1,000,000 and is to be completed by the end of 1925. The Mitsubishi estate contemplates also the erection of a building with 18,000 *tsubo* floor space, 1,000 more than the Marunouchi building, on the now vacant site directly north of the Marunouchi building and east of the Kaijo building. The plans for this building are, however, still indefinite.

ELECTRIC

SSUPINGKAI ELECTRIC PLANT.—The new electricity works for the Chinese town of Ssupingkai, Manchuria, according to Prefect Yin of Lishu, has its S.Y.120,000 the capital in 1,000 shares of S.Y.120 each, paid up. About two-thirds of the machinery has been received, and the construction of both power-house and office is to be started at the end of this month. Two cooling water wells are under excavation. The subscriptions to the lighting service have exceeded 2,400 lamps, and are expected to reach 3,000 lamps soon. The machinery is furnished by the Siemens China Co., and the daily consumption of coal for fuel is about 1 ton.

Mr. Wu Pei-shan, manager of the branch of the bank of communications in the new town, a graduate of the electrical engineering course of the Tokyo Technical University College, drew the design for the new works.

LIAOYANG-MUKDEN POWER LINE.—Tests of the new line for transmission of power from Mukden to Liaoyang, are finished and the line stood up under trial transmission of current of 55,000 volts. The switch-boards indoors and the transformers installed outdoors were subjected to high pressure tests. To begin with, 1,000 kilowatts are to be supplied to the Manchuria Spinning Mill, Liaoyang, until October, also 150 kilowatts to the railway repairing shops. At present, 14,110 lamps are installed at Liaoyang. The existing power station is to be held as a reserve for the time being.

SINGAPORE POWER PLANT.—The Singapore municipality has purchased land in the neighborhood of St. James' Walk for the construction of the new municipal electrical power station. The amount paid to the owners, Mr. S. Q. Wong and others, is said to have been nearly one million dollars.

SSUPINGKAI ELECTRIC WORKS.—The installation of an additional generator at the Ssupingkai Electric Light Co., which has been delayed owing to the destruction of the Shibaura plant, Tokyo, in the earthquake, will be made at the end of August.

AMANOGAWA POWER HOUSE.—In order to supply power to the new spinning mills, nearing completion at Choushuitzu north to Dairen station, and Chinchou, a new turbine of 5,000 kilowatts has been installed at the S.M.R. Co. Power House, No. 2, in Amanogawa, Shakako. The work was begun in April. The power house now is generating 10,000 kilowatts.

ELECTRIFY KUSATSU RAILWAY.—Electrification of the present fifteen miles of track laid, and its extension as far as Kusatsu, the spa at the foot of Shiranesan, is the plan of the Kusatsu Tetsudo Company which now operates a light railway from Karuizawa station to Tsumakoi, some twelve miles. This light railway was put into operation in 1914. The company's capitalization has been increased to Y.2,000,000, to carry out the electrification and extension of the line.

S. M. R. ELECTRIFICATION.—The S. M. R. Co., has completed its plan to electrify the trains operated on Dairen wharves and on the Fushun branch line, to economise in operating costs, and to turn to good account what is called coal shale or rubbish.

The Company intends to set apart an appropriation of Y.37,000,000 for the construction of electric locomotives, to be undertaken over 2 years from 1925.

Under the existing steam system, on the Dairen wharves, the annual total costs are Y.485,000 as against Y.408,000 for the electric trains per annum.

As to the Fushun branch line, in addition to economizing the expenses, the following advantages will be secured:

Coal shale and other by-products may be utilized. Communications between Fushun, where power is generated, and Mukden, whereto power is supplied by Fushun, will be materially improved. It has been found that the readiest way to utilize non-saleable coal shale, is by low temperature dry distillation, to convert it into power gas for operating trains and valuable by-products such as sulphate of ammonia and coal tar derivatives.

INDUSTRIAL

ABATTOIR FOR SEMARANG, N.E.I.—The Semarang municipality has been authorized to float a loan of 1,100,000 guilders (the guilder = $0.40), which, when realized, will be appropriated as follows: Construction of abattoir, 830,000 guilders; general building, 200,000 guilders; laying of water mains, 50,000 guilders; and miscellaneous, 30,000 guilders. (Trade Commissioner Jesse F. Van Wickel, Batavia, Java.)

EXTEND P. I. SUGAR CENTRALS.—All mechanical improvements, looking toward greater sugar production by the Philippine National Bank centrals in Negros, the Philippines' greatest producing centre, are provided for in contracts for new machinery and equipment, awarded to various Manila firms during the last few weeks, details of which were made public recently. New mill additions will be constructed. More transportation equipment will be added. Better electrical equipment has been provided. More than P.3,500,000 will be expended on the additions.

The Earnshaw Docks and Honolulu Iron Works have been given the contract for the extension to the Ma-ao Sugar Centrals company. This includes a new mill, vacuum pans, centrifugals, and general equipment.

The Catton-Neill Engineering and Machinery Company has been awarded the contracts for the centrifugals, pumps and electrical equipment for Isabela and Ma-ao centrals. The Catton-Neill Company is also furnishing the new boilers. Additional installation of equipment at Talisay is being built by the Earnshaw Docks and Honolulu Iron Works Company. This company was the original builder of the Talisay plant. The additional equipment will bring the plant to capacity in all departments. Approximately 2,000 additional daily tons of transportation equipment, including cars and locomotives, is being purchased from the Koppel Company and the Pacific Commercial Company.

Two large warehouses are to be installed soon at Pulupandan and Hinigaran. Contracts have not yet been awarded. Fifteen hundred feet of wharf is to be extended to the present Bacolod and Talisay wharf. This will give greater loading capacity with ships enabled to go up to the dock for bags of sugar at low tide and during the entire day. At present, loading is handicapped.

HAIPHONG GLASS FACTORY.—French firms now are pursuing the policy of setting up factories abroad and one of the latest arrangements of this kind has been made by a number of glass manufacturers. The Société de Terreries d'Extreme-Orient is an association representing the Société de Saint-Gobain, the Société de Glaces Nationales Belges, the Société Financiere et Coloniale, the Distilleries Indo-Chinoises, and the Société de Chimie d'Extreme-Orient. This organization contemplates doubling its capital of 5,000,000 f., and as a means of keeping a hold on the Far Eastern market, will supply buyers there with goods from factories at Haiphong, Tonkin.

DAIREN'S PLATE GLASS FACTORY.—The erection of the new plate glass factory by the S. M. R. Co. ceramic experimental institute at Dairen, is making fair headway. The warehouse has already been completed. In about a month or so, the office and auxiliary buildings will also be finished. The machinery, Flinck system, has been imported from America, and the new factory is expected to be ready to put out plate glass from about January next. Late in August, Mr. Flinck investor of the Flinck system, is also expected at Dairen. Necessary gas service will be available at short notice. Two American engineers will aid in

getting the glass works into running order and the output of the new factory is expected to be equal to that of any other country. Advance orders have been received from Shanghai, Tientsin, Harbin, and the South.

CHINCHOU MATCH-STICK FACTORY.—A new match-stick factory is being erected on a tract of land adjoining Chinchou station an hour from Dairen by rail. The first factory has five machines and work will be begun by operating three of them to a capacity of 25 carloads of match-sticks a month. This first plant is an experiment, and should the results be satisfactory, the scale of manufacture will be greatly enlarged. The promoters are Kobe capitalists.

PLAN FUSEL OIL PLANTS.—Methods for the recovery of fusel oil, chemically known as amyl alcohol, in the alcohol-distillation industry of the Philippines, have recently been developed by the bureau of science at low cost and it is expected that considerable expenditures for the necessary plant soon will be made. Fusel oil recovery is a new enterprise for the islands, although it has existed in other countries for some time, it was said. Fusel oil is a very useful and versatile substance and, because only a few tenths of one per cent. of the main product, alcohol are recovered, it is in great demand. The most important use is as a solvent for nitrocellulose in the manufacture of celluloid. It also is the starting point in the preparation of several artificial or "synthetic" perfumes and flavors, and in the manufacture of patent leather for shoes. Large quantities are used in paints, varnishes, and lacquers, for special purposes such as the protection of metals from corrosion where a non-metallic coating is desired.

JAPAN'S AIRPLANE WORKS.—At present planes, motors, and accessories are made in one of the departments of the Kure naval munition factory, but in view of the enormous amount of work entailed by aerial preparedness, the authorities have decided to separate the plant, and erect an independent factory at Hiroshima, to employ 10,000 workers solely for manufacturing aeroplanes and parts thereof.

AIRPLANE FACTORY IN MANCHURIA.—The new airplane factory under management of a French expert, outside west gate, Mukden, is now being equipped. Airplane accessories beyond the scope of the new factory are to be imported direct from France to be assembled at Mukden. At present, one machine under re-erection. Marshal Chang Tso-lin is reported to be taking up manufacture of flying machines extensively though the present factory is on a modest scale and is the first plant of the kind in the three eastern provinces. A new hanger is under construction under east tower, outside east gate. At present, there are said to be over 70 airplanes in all Manchuria, including those that have not yet been assembled.

SHANGHAI SUGAR REFINERY.—The machinery of the China National Sugar Refinery Company, Ltd., a company organized in 1921, is being installed, and operations are expected to be started this autumn. One-fourth of the total capital of $10,000,000 has been paid up. Mr. M. Y. San is president and Mr. C. F. Yien, vice-president. The refinery, which is at Woosung near the Szetang River, is designed to melt 200 long tons of raw sugar a day. The raw materials will mainly be 96 degree raw sugar of which the largest part will be supplied by mills in Java and Kwangtung province. The machinery, which was ordered in November, 1922, is being supplied by the Grevenbroich Maschinenfabrik of Germany, and an agent of the company has come to China to supervise installation. China now imports from Hk. Tls. 30,000,000 to Hk. Tls. 50,000,000 worth of sugar yearly. The works of this Company will be the largest of the kind in China.

GLASS FACTORY FOR DAIREN.—Plate glass will be manufactured in Dairen by the South Manchuria Railway company in a new factory that will cover 20,000 *tsubo* to be completed glass making machinery is to be ordered from the United States.

NEW SUGAR CENTRAL FOR PHILIPPINES.—A new sugar central is in the process of organization in Capiz with construction expected to be completed in time to take care of next year's crop. M. Inglish, mechanical engineer of Negros, is in charge of the construction of the mill and installation of machinery.

MANUFACTURING

CAMPHOR REFINERY IN HONGKONG.—The camphor refinery belonging to Messrs. A. S. Watson & Co. (Ltd.), which was wrecked by the heavy typhoon on Aug. 18, is now rebuilt. The new plant, when in full operation, will have a capacity of approximately 10 tons of high-grade refined camphor per month. It is the intention to specialise on camphor in tablet form, the tablets to vary from one-eighth of an ounce to 2 ounces in weight, and the camphor will have a purity of from 99 to 99.5 per cent.

NEW PARAFFIN FACTORY FOR FUSHUN COLLIERIES.—An appropriation of Y.123,000 has been set apart in the estimates of the S.M.R. Co. for establishing a paraffin factory at the Fushun Collieries. The collieries have been carrying on the dry distillation of tar residues for obtaining heavy oil, gas. The new scheme above mentioned is to supply the company's own wants in paraffine, which have hitherto been procured from Japan.

JAPANESE CEMENT FOR JAVA.—The Onoda Cement Factory, Choushuitzu, now supplying 700,000 barrels of cement a year, has opened a business relation with Java through the Mitsui Bussan Kaisha and many thousands of barrels of Onoda cement already have been shipped. The cement is intended for road-building and construction of sugar refineries, etc., in Java.

RADIO

WIRELESS STATIONS FOR CHOSEN AND TAIWAN.—Chosen and other overseas possessions are still so poorly equipped with means of telegraphic communication, that the Japanese communications authorities have decided to construct two big powerful wireless stations solely devoted to communication with Chosen and Taiwan colonies, and have already started work on them. By the time they are completed, Chosen is expected to be in a position fully to carry on communication with the home-land through them. The wireless station at Ryuzan, however, is too old and too poorly equipped to serve such purpose. In view of this, the communications bureau in Chosen is considering measures to improve radio facilities. An official of the bureau has stated that the projected wireless stations, one at Kemigawa, Chiba prefecture, and the other at Iwatsuki, Saitama prefecture, now under construction, will be linked up with Chosen by a new Ryuzan station, estimated to cost Y.500,000 When the project is carried into effect, he says, it will be easy to handle more than 2,000 messages a day, thus greatly lessening the present congestion in telegraphic communication. To attain this by ordinary telegraphy, it would be necessary to lay new cables connecting Seoul and Tokyo at a cost of Y.1,700,000. In Taiwan it has already been decided to construct a powerful radio station at Keelung at a cost of Y.2,500,000, the example to be followed by Dairen at an early date.

RAILWAYS

SOUTH MANCHURIA RAILWAY ELECTRIFICATION.—A scheme to electrify the whole of south Manchuria is under contemplation by the South Manchuria Railway Company. Engineers investigating the source of the Yalu river have discovered, 100 miles north of Antung, a drop in the river from which, it is estimated, 100,000 kilowatts of electricity can be generated. The intention is not only to supply light, heat and power, including that to electrify the railway itself, but to use the power in the development of agriculture.

JAPAN ELECTRIFICATION WORK STARTS.—The ambitious plans of the imperial government railways of Japan for the substitution of electricity on the Tokaido railway line at the Kobe terminal has been started by the Kobe railway bureau. The entire line will be electrified by the end of 1928, according to present plans. The first phase of the work is the right-of-way between Maihara and Akashi. The second section to be electrified is the road between Maihara and Kyoto. These two sections will be completed by January 1, 1926. During the fiscal year 1924-25 it is planned to electrify the Tokaido from Tokio as far as Kozu, 50 miles to the southwest, and also the branch line to Yokosuka, the naval base on Tokio Bay. American equipment will be largely used in the electrification scheme.

The railway department has been negotiating with private interests for the purchase of a site for a power plant to furnish electricity for this section. When the Tokaido line is electrified the efficiency of the road will be raised 20 per cent., running speed will be greater and the overhead expenses will be reduced by 30 per cent.

TO OPEN LINE TO ATAMI.—Japanese railway experts believe they will be able to open the new railway line from Odawara to Atami next March. The line from there to Mishima, through the Tanna tunnel, will be completed in 1928. Twenty-five thousand six hundred feet or approximately half the length of the Tanna tunnel has been driven. Engineers are being hindered greatly by the seepage of water through rock cracks in the Tanna tunnel, but as soon as this is overcome with cement, the work will be easier and faster, say the expert.

PLAN LINE TO CHENGTU.—A plan is said to be afoot in the civil governor's office and the Szechuan railway and mine bureau for the construction of a railway between Chengtu and Chungking, a distance of about 900 *li*. Capital is to be raised privately among the people of the province. A petition for approval has been forwarded to the effect that authority is given for the construction of the proposed section, prior to which, however, plans in detail must be submitted for endorsement.

NEW TUNNEL SOON OPEN.—A government electric car service between Tokyo and Yokosuka via Ofuna will be inaugurated early next year. As a first step for electrifying the government railway services on the Tokaido and elsewhere, the department of railways has been cutting a tunnel between Ofuna and Hodogaya extending 48 chains which work is expected to be completed in September. The work was started in July, 1922, with Y.1,000,000. The new tunnel, when completed, will be the longest tunnel east of Hakone. Before the earthquake of September 1, the greater portion of the work was completed and not a single fissure was produced in the tunnel by the earthquake. At present, the finishing work such as the construction of arch, etc., is in progress.

KONGOSAN ELECTRIC RAILWAY.—Work on a section of eighteen miles between Tetsugen and Kinkwa on the Kongosan (Diamond Mountain) Electric Railway being finished, the section was opened to traffic on August 1, with rolling stock borrowed from the South Manchuria Railway. Work on the remainder of the 62 miles, connecting Tetsugen and Kwasen, is being steadily pushed on, the section between Tetsugen and Kinkwa, 14 miles long, being already completed. The Shibaura Works in Tokyo is speeding up the construction of the rolling stock for use on the railway but will be unable to complete it before September or October next.

LUNGHAI RAILWAY LOAN.—The *Chen Pao* says that the Lunghai Railway is to resume construction of the section between Sianfu and Lanchow and that a loan agreement has been signed by the ministry of communications and a group of Chinese banks, a Belgian bank participating because it held an option over this section. The loan is for $5,000,000, repayable in 10 years, the issue price 90, interest 8 per cent.,

and the security the revenues of the Lunghai Railway. The group includes the Bank of China at Chincheng and the salt industry at Chungnan.

The actual amount of the loan is Fcs. 75,000,000, which will be issued in Europe by the Banque Belge Pour Etranger to purchasing railway material, and also $10,000,000 to be issued in China to cover the cost of construction. The section of the railway to be constructed first is from Chengchow, Honan, to Sianfu. The agreement represents a modification of the old Belgian agreement of 1912, and the continuation of the line to Lanchowfu will be carried out later, while Dutch interests will complete a short section near Haichow—Extensions to Sianfu, the capital of Shensi.

HARBIN-TAHEIHO LINE.—Permission to build a railway between Harbin and Taheiho, a distance of 140 miles, has been obtained by a Russian named Skidelski, recommended by the *tuchun* of Heilungkiang, from Mr. Ma Chung-chun chief of the railway negotiation bureau, who has been in Harbin for some time past. The concession, which is said to have been signed in secret, reads as follows, according to an authentic source: (1) Mr. Skidelski shall manage the railway for 28 years after construction is complete. Thirty per cent. of the net profits shall be paid to the Heilungkiang government. (2) The railway shall be delivered over to the Chinese authorities at the end of 28 years, without indemnity. (3) The gauge of the proposed railway shall be five feet and one inch, the same as the Chinese Eastern Railway. (4) The capital shall be 20,000,000 yuan.

The Chinese chamber of commerce in Heilungkiang opposes the concession on the ground that while the first and second conditions are favorable to China, the third is contrary to the fundamental policy of the Chinese government to standardize the gauge of Chinese railways, and that all freight will be swallowed by Vladivostok when the Harbin-Taheiho railway is ready. The Chinese also claim that Russian influence will be paramount in Heilungkiang province and that the South Manchuria Railway Company will be affected owing to the difference in gauge. The actual cost of construction is estimated at $1,000,000. Consequently, the Chinese say half the capital and more, is to be spent in secret service money. It is surmised that the funds are to be raised in the United States.

PHILIPPINE R. CO., BUYS KOPPEL CARS.—The Koppel Industrial Car and Equipment Co. have been awarded an order for fifteen 30-ton double truck cane-cars by the Philippine Railway Company, Iloilo. These cars will be used for hauling sugar cane over the company's main lines to the Central Asturias.

CANTON-KOWLUNG RAILWAY.—The Central government has decided that the Canton-Kowlung railroad must be maintained at all costs, according to Peking despatches, and is ready to provide funds to keep it in condition. The ministry of communications, it is said, has asked Mr. Wen Teh-hua, director of the road, to come to Peking. He will be given $50,000 to maintain the road in addition to which the ministry will ask the Shanghai-Nanking line to donate $150,000 more.

JAPAN ELECTRIFIES LINES.—The department of railways is making plans for the electrification of four more lines, the Chuo, Ou, Hokuroku and Jyoetsu. All have numerous tunnels and sharp curves. The Chuo line, between Tokyo and Hachioji, runs more than 50 miles and has 40 tunnes which have impeded the efficiency of it. The electrification would be completed by 1929. Twenty-six miles of the Ou branch would be electrified, between Yonesawa and Fukushima, while on the Hokuroku line, the road between Maibara and Konjyo, a distance of 47 miles, would be improved. It is expected to cut the running time on the Hokuroku line by 40 per cent. Work on the electrification of the Tokaido line is progressing rapidly, the railway department reports. The section between Tokyo and Odawara probably will be completed by next June and the entire electrification by the end of 1929.

TAI-CHI RAILWAY LOAN.—A message is said to have been received in Peking from London approving the proposed contract for a loan by the Peking Syndicate on the Tai-Chi railroad. It is said that the loan contract prohibits the use of any of the funds for other than railroad construction purposes. The total amount of the loan, according to the Chinese papers, will be £1,500,000.

ANHWEI COAL LINE.—The Pu Yi Mining Co., Liehshan, Anhwei province, has petitioned the ministry of communications for the right to build a light railway to transport coal from Liehshan to Fulitsi, a distance of 13 miles, at the company's expense. An increase of capital, amounting to $900,000, is to be used for construction. The proposal is under consideration by the ministry.

TAONAN-KHINGAN RAILWAY.—Fengtien authorities together with the Mongolian princes are said to be planning the construction of a railway from Taonan to somewhere in the Khingan mountains in Eastern Mongolia. The line is to be known as the Taonan-Khingan Railway for construction of which $6,000,000 has been voted. Funds are to be raised in Fengtien, Kirin and Heilungkiang.

RAILWAY PLANNED NEAR PEKING.—The military authorities of Nanyuan, Peking, are asking the government for permission to construct a railway between Nanyuan and Hwangtsun near the capital. Work will be started as soon as approval is obtained from the ministries concerned.

SOUTH MANCHURIA RAILWAY.—At the 23rd meeting of shareholders of the South Manchuria Railway Co., held on June 21, the total capital of the company was reported to be Y.440,000,000, of which Y.380,000,000 is the present capital and Y.60,000,000 additional subscriptions still to be collected. The net profit for 1923 was Y.34,000,000, and a dividend and bonus amounting to 10 per cent. was declared.

CABLE ROAD UP FUJI.—Tokyo financiers are behind a movement to build a cable car railway up Mt. Fuji. The organization is to be called the Mt. Fuji Climbing Railway Company. It is to be capitalized for Y.1,000,000. Plans are to have the road built from the Yoshida entrance to the eighth station.

The promoters already have applied for permits the applications being on file at the department of home affairs and railways. Both departments have instructed the construction section of Yamanashi prefecture to make a survey of the mountain in connection with the project. A party of engineers, headed by Mr. Yoshida, will make an investigation.

TSOTSUYAO COLLIERY LINE.—The Tsotzuyao Colliery, near Wafangtien, Mr. H. Morita, manager, proposes to enlarge the scale of operation from next October to increase the annual outputs to above 70,000 tons. It is proposed to build a light railway line between the colliery and Wafangtien at a cost of Y.30,000. Some of the light rails between Changchun and Shihpeilin are to be taken over for use by the new line. Two engines and twenty-five ton goods cars, formally run on the Mukden-Antung light rail line, will serve as the initial rolling stock more to be purchased later.

RIVERS AND HARBORS

VLADIVOSTOK HARBOR.—The Ussuri Railway management has been carrying out several plans of improvement on the harbor facilities of Vladivostok since last winter, and now has a bean oil tank of 2,000 tons under construction, to be finished in August. The loading of bean oil into steamers in berth is being effected by means of pipes. The railway plans to construct waterworks, to supply shipping. Berthing sections not deep enough for large steamers, have been dredged, and much reclamation work has been done.

PORT ARTHUR HARBOR IMPROVEMENTS.—In view of the increase in South Manchuria exports in general and Fushun coal in particular, the South Manchuria Railway Company is planning to increase the capacity and shipping facilities of Port Arthur. Bridges, piers and jetties will be constructed. The total cost will be about Y.380,000, and the construction will probably be continued for four years.

SHIPPING

K. Y. K. TO HAVE NEW BOATS.—The Kinkai Yusen Kaisha (Agents N.Y.K.), which was separated from N.Y.K. to develop the coasting service in April last year, has under construction two speedy ice-breakers at Yokohama to shorten the distance between Moji and Tientsin, and to continue winter navigation safety in the Gulf of Pechihli. One of these sister boats the *Nanrei Maru* having been completed, soon will be placed on the Tientsin run and will mark a new era in the traffic facilities in North China. She is over 2,000 tons gross, and develops a speed of 12 knots with a large reserve of power. Having been specially designed for this service, she is provided with electric fans, heating system, wireless apparatus, ice-breaking arrangement and all modern conveniences conducive to the safety and comfort of passengers and crew. The remarkable feature is that she has a 150 tons cold chamber on No. 3 deck so as to be able to carry fresh beef, fish, fruits, vegetables, etc., between Japan and Tientsin.

TO STABILIZE STEAMERS.—The department of railways will install stabilizers in its ferry-steamers between Shimonoseki and Fusan, Chosen. The three boats, the *Keifuku Maru*, the *Tokuju Maru*, and the *Seikei Maru*, advertised as the pride of the department, have become targets of criticism of late for their frequent inability to keep to their schedule. It is said that these boats cannot stand the rough voyage, due to their violent rolling. But with the opportunity offered by the repairing of the *Keifuku Maru* at the Mitsubishi Dock, the department decided to install a stabilizer in consideration of the successful result shown in an experiment on the *Mutsu Maru*, which demonstrated a surprising resistance against storm. The expense of a stabilizer is estimated at about 100,000 yen. This price is very much cheaper than the American stabilizer which costs a half million yen.

SOUTH MANCHURIA RAILROAD STEAMERS.—A plan for building two large passenger steamers to be placed on the regular Dairen-Shanghai service has been drafted by the South Manchuria Railway Company. Two modernly-equipped passenger steamers, each of 4,000 tons, are to be built according to the plan, and negotiations will be opened by the South Manchurian Company with the Mitsubishi shipbuilding yard, in Nagasaki, for the construction. Baron Kinmochi Okura, a director of the railway, has the matter in hand.

THE TAIKOO DOCKYARD AND ENGINEERING CO., LTD., is now building for the Hongkong, Canton and Macao Steamboat Co., Ltd., a big new river steamer to replace the *Heungshan* which struck a rock and was beached in Canton River. The new vessel will cost about $900,000 and will be about the same size and length as the *Lungshan* which was built for the same company at Kowloon Docks in October last. The vessel will be of a different type, especially so far as her engines are concerned, and will be a most up-to-date vessel in every respect. Her builders hope to be able to get from this new vessel a far higher speed than that of any other boat which the company owns. The order was secured by Taikoo in open tender with other firms.

SHU NAN CO., LTD.—The Shu Nan Steamship Navigation Co., Ltd., which has been promoted by Sun Tze-lin and others for the inauguration of another service on the Upper Yangtze, is now being organized. Capital is to be Tls. 50,000. It will have 12 motor boats sailing between Luchow, Kiating, Hsufu, Fushun and Chungking. The boats, which are to be ordered at Kiangnan Dockyard, will

be 34-ft. long and 6-ft. wide with a displacement of 2-ft.

N.Y.K. TO IMPROVE SHIPS.—Special consideration is now being paid to the improvement of regular passenger liners by the Nippon Yusen Kaisha on its leading services such as the European, trans-Pacific, Seattle and Japan-China. A decision has recently been reached by the firm's directors to concentrate its available energy on the improvement of equipment for its large passenger steamers without paying attention to the declaration of high dividends, and that all available funds be employed as much as possible for this purpose.

To begin with, the Nippon Yusen will replace three steamers of the *Kitano Maru* class on the regular European lines, including the London and Liverpool services, by modernly equipped steamers of 14 knots speed. The *Kitano Maru* and two other steamers will be purchased by the Kinkai Yusen Kaisha to be placed on the Formosan service to rival the *Fuso Maru* and *Horai Maru*, newly placed by the Osaka Shosen Kaisha on its regular Formosan line.

On the completion of two 10,000-ton class freighters next autumn in Glasgow, which the firm ordered last year, the Nippon Yusen will place these new vessels on the trans-Pacific service. These new ships can develop a speed of 12 knots an hour as against the 10½ knots developed by the present freighters. The firm's Seattle service is now almost virtually suspended as the firm was outstripped in competition by American ships and the firm once decided to practically discontinue the service for good in anticipation of the prospective operation of Article 28 of the United States shipping law. Now that the Jones' act has been deferred, the firm will pay attention to the resumption of the service on a paying basis. Improvement will also be made on the Australian service and arrangement of ships to be alloted on it will be announced shortly, it is reported. The firm recently introduced a marked improvement on its Nagasaki-Shanghai regular passenger service and extended the base of operation to Kobe with Nagasaki and Moji as intermediate ports of call.—*Japan Advertiser.*

MITSUBISHI BUILDS STEAMER.—The Dairen Steamship Co., has ordered from the Mitsubishi Dockyard Co., a new 5,000 ton steamer of the *Shanghai Maru* type now on the Kobe Shanghai Line. The estimated cost is about Y.1,800,000. The steamer is to be completed by July, 1925.

TAIKOO LAUNCHES STEAMER.—The river steamer *Sai On*, built to the order of the Tung On Steamship Company, was launched at Taikoo Dockyard recently.

THE VESSEL.

The *Sai On* is a sister ship of the *s. Tung On*, launched last month, of which we gave full particulars at the time. She is a steel twin-screw river steamer, with an overall length of 233 feet, breadth 42 feet and moulded depth to main deck 12 feet. There is accommodation for thirty first-class passengers in beautifully appointed staterooms, and 68 open berths for second-class passengers.

The vessel is equipped with all the latest requirements for piracy prevention, including wireless telegraphy installed by the Marconi Company, this being the second river steamer to be so fitted, the other being her sister ship.

MITSUI BUILT MOTOR SHIP.—The first large Diesel motor ship to be built in Japan, under the direction of Japanese engineers and with Japanese labor, has been tested to the satisfaction of Lloyd's representative and has sailed for America. The vessel is one of the finest of the new additions to the mercantile navy of the Japanese empire. Turned out by the Mitsui Bussan Kaisha in their Tama shipbuilding yard located in the Inland Sea, the vessel is reported to have been built throughout of Japanese material, with the exception of the machinery which was supplied by Messrs. Burmeister and Main, Ltd. This motor ship has been christened the *Akagisan Maru*. It is a two-deck vessel, capable of making an average speed of 10 to 11 knots fully loaded. It has a deadweight tonnage of 7,100 tons; a gross tonnage of 4,630 tons; an overall length of 375 feet; a maximum breadth of 50 feet and a draught of 24 feet 3 inches. All the cargo hauling devices and other appliances are electrically worked, as are the windlass, the steering gear and the cooking apparatus. The hull was designed by the engineer in the employ of the Mitsuis and subsequent vessels of this nature are to be built in conformance with this design. The cargo handling is worked by several electric winches, is said to be 8,000 tons of 40 cubic feet.

A long-stroke type Diesel main engine, with six-cylinder, four-cycle, single-acting, forced-lubricated, cross-head, capable of developing 2,360 imperial horse-power forms the main propelling machinery. There are also three auxiliary Diesel engines, while the pumps are electrically worked. At the trials, an average speed of over 12 miles an hour was registered, while the consumption of oil was at the rate of about 7½ tons for a running period of 24 hours.

TELEGRAPHS AND RADIO

NEW PHILIPPINE PROJECTS.—Six important telegraph lines connecting Manila and rich agricultural regions and 12 more radio stations in Luzon, Visayan and Mindanao will be established by the bureau of posts next year, according to plans now being studied by the postal officials. Included in the proposed program is a cable line connecting Cebu and Iloilo, Superintendent Padua of the telegraph division reported. The six telegraph lines are: from Manila to Cagayan Valley along the new road; Ilocos to Cagayan province, passing the northern coast of Luzon; Laoag to Vigan; Negros Occidental to Negros Oriental; Mariveles to Limay, Bataan; and Dagupan to Lingayan.

The 12 proposed radio stations include one in Butuan which will connect Cebu and Surigao and another one in Borongan, Samar to improve the present service in the east coast of the island. The present line from Catbalogan to Borongan is always interrupted during the rainy season, it was reported.

TOKYO RADIO STATION.—A wireless station which has been under construction at the Tokyo Central Meteorological Observatory, is now completed and in operation. This station will co-operate with the marine observatory in Kobe in sending out correct time and weather report to steamers navigating on the open sea. The new wireless station also will be able to send weather reports to steamers off the coasts of Kurile islands and Hokkaido. The Kobe marine observatory has been sending weather reports to them in the past but the message often failed to be received accurately on account of the great distance.

TELEPHONES

HANKOW-LOYANG 'PHONE LINE.—Marshal Wu Pei-fu is hastening the construction of the long-distance telephone between Loyang and Hankow for military purposes, and work will start at once. According to Peking advices, it is learned that Messrs. Andersen, Meyer & Co. have secured the contract. While the exact estimate of the cost has not been stated, it is reported that the installation will involve several hundred thousand dollars. Mr. Yeh Kwei-hsin, who has been the superintendent of the Hankow telegraph administration, has been retained by Marshal Wu Pei-fu to take charge of the installation work, which, when completed, will be a great military convenience.

TRAMWAYS

ELECTRIC LINE TO ODAWARA.—Trains drawn by electric locomotives instead of the present steam engines will run between Tokyo and Odawara before the end of the present year. The electrification of the line had been long under consideration prior to the earthquake disaster and a sufficient number of cars were constructed to be used on the line, which, however, on account of destruction of so many cars, had to be used otherwise in place of those lost. Until sufficient new cars are constructed the plan is to use the present train equipment, but electric engines.

WATERWORKS AND IRRIGATION

HONGKONG WATERWORKS SCHEME.—Tenders are now being called for part of the first section of the Shing Mun waterworks scheme, namely, the north and south tunnels, the south conduit and contingent works. The official notice states that the work consists of driving and necessary lining of two tunnels, approximately 2,160-ft. and 4,680-ft. in length through smugglers' ridge and golden hill respectively, the construction of an open conduit approximately 2,000-ft. in length and contingent works.

TOKYO SEWER SYSTEM.—Tokyo will have one of the best sewer systems in the Orient when the present scheme of laying a ferro-concrete channel 18-ft. in diameter from Asakusa to the Rokugo river near Tsurumi between Tokyo and Yokohama, is completed in 1928, according to Mr. Z. Hara, chief of the Tokyo municipal sewer office. One thousand four hundred laborers are working daily, digging the ground to lay this gigantic channel. By next year the total number of laborers will be increased to 3,000, says Mr. Hara. The cost of the new sewer system will be Y.120,000,000. When the sewer reaches Rokugo river through this big channel it will be purified there and then allowed to flow into the sea. This will eliminate the drainage of the sewers into the Sumida river.

SEWAGE WORKS IN SEOUL.—Work on the projected sewage system in Seoul was started by the prefecture in the year 1918 and it was originally intended to complete the first stage this year at the estimated cost of Y.1,618,000, part of the money being defrayed from the national treasury and provincial estimates as aids, and the rest by the prefecture by means of loans. Increase in wages and rise in the price of materials have halted the work, leaving the part uncompleted for the second stage which will be started next year at the estimated cost of Y.1,400,000 spread over five consecutive years. On its completion Seoul will possess a complete sewage system. For Ryuzan the work is expected to be executed in the course of three years following at a cost of Y.420,000.

LIKAS DRAINAGE SCHEME.—The land owners at Likas, near Jesselton, British North Borneo, have agreed amongst themselves to pay a flat drainage rate upon their holdings. The drainage system taken over by the Likas board consists, at present, of an embankment along the sea beach with three self-operating sluice gates in it. These works were constructed in 1917 and 1918. Two or three miles of main drains take the water from 720 acres of coconuts and clear it through the gates at low tide. Mr. Bateson in 1917 wrote that the sluice gates must exclude sea water, must provide for drainage to an adequate depth, three feet being desirable, and must be large enough to take away flood water with reasonable rapidity. The three gates are still functioning well, but they require repairing and watching. At present one of the main drains is almost completely blocked by fallen timber caused by cattle trespass, so that the system is far from efficient. The agricultural department reported in 1922 and in 1923 that the coconuts were not doing at all well owing to stagnant water, but the department was of opinion that, if properly drained, the area would be good for coconut cultivation.

NEW WATERWORKS FOR CHINCHOU.—The railway town of Chinchou is to have its own waterworks, and work is to be started at once. The estimated cost of Y.80,000 is defrayed out of the local administration list. Of this sum Y.50,000 is to be laid out in the current fiscal year, the remaining Y.30,000 in the next fiscal year. A well, 30-ft. in diameter and 200-ft. deep, is to be sun kat North Sanlichuang 2½ miles northeast of the Chinese town of Chinchou. The well water is to be pumped up to a reservoir on the heights of Sanlichuang, to be distributed by iron pipes to both the Chinese and railway towns. The new waterworks will not only serve in sanitation but also may lead to the establishment of sundry industrial enterprises such as a new branch plant by the Naigai Raw Cotton Spinning Co., now under contemplation.

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THE FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE

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CHINA'S FIRST LONG-DISTANCE POWER LINE

NEW YOKOHAMA SPECIE BANK BUILDING

THE PRESSURE OF POPULATION

ANGAT RIVER PROJECT

TELEPHONES IN LHASA

CONSERVANCY WORK ON THE YUNG TING HO

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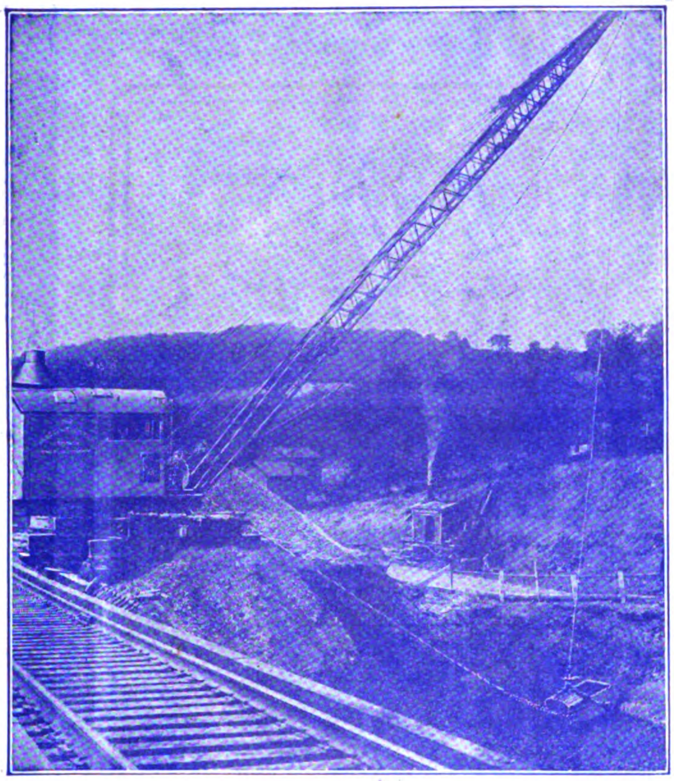

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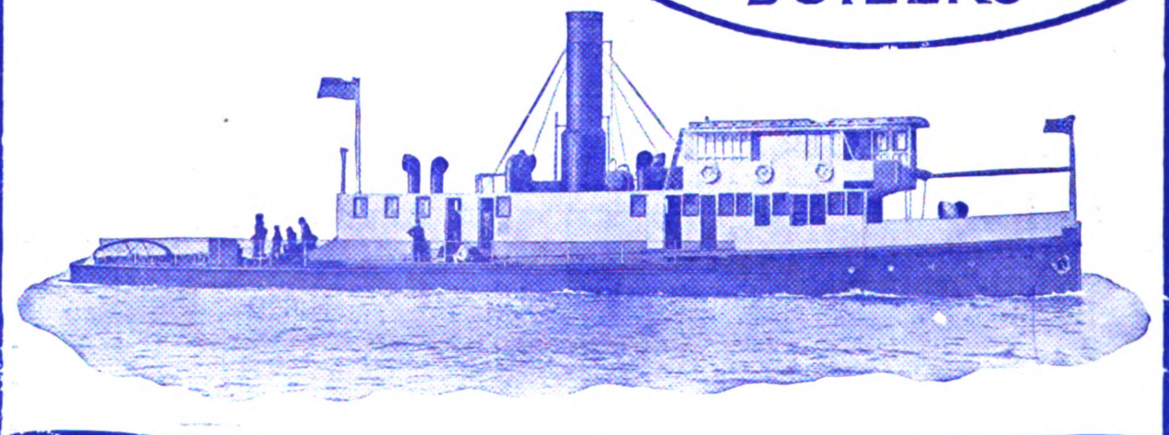

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Pressure of Population

Where Will America Expand?

A FEW years before his death, Admiral Peary predicted that by 1950 the southern boundary of the United States would be the Panama Canal. Now comes Admiral Rodgers and says the same thing in another way, by asserting before the Institute of Politics at Williamstown, that when the population of the United States reaches 200,000,000, it will be forced to wage war to maintain its place in the world. This frank expression of opinion was undoubtedly inspired by the prediction of Dr. Henry Pratt Fairchild before the institute that the population of the United States at its present rate of increase at the end of the 20th century would be 550,000,000. By 1950, the saturation point would be reached, and, according to Admiral Rodgers, Americans, deprived of those opportunities for development, which have moulded and determined their character and outlook on life, would demand their place in the sun.

Admiral Peary threw a bomb into the pacifist camp and shocked the sensibilities of Americans who fondly believe that under no circumstances will their country expand in the future at the expense of its neighbors. The statement of Admiral Rodgers also created a storm amongst the pacifist group at the institute who compared his speech to the utterances of militarists like von Tirpitz and others. Answering the argument of Dr. James T. Shotwell, professor of history at Columbia University, in support of the plans sponsored by the league of nations, which brands aggressive war as "international crime," Admiral Rodgers said he questioned whether the nations of the world were obsessed by an abhorrence of war, and then made the flat statement:

"I do not suppose that the United States will ever desire to make war against any country before our continental population passes 200,000,000," he said, "but after that, if there remains any manhood in our mixed race of descendants, we will surely go to war to keep our place in the world."

Here we have the opinion of the red-blooded fighting man who looks facts in the face and knows his own kind. We agree with Admiral Rodgers, and the late Admiral Peary. The United States now contains 114,000,000 people, and within the life time of the present generation or in another twenty-five years that number will be almost doubled. As the wonderful opportunities gradually disappear in America, and the pressure of population forces our young and adventurous sons to seek their future in surroundings which have contributed so much towards the making of the American character, they will overflow into Mexico and Central America. With 200,000 or more adventurous Americans settled in Mexico, the day will come when a situation will be precipitated, and in the same way that Texas became part of the union, in the same way that Hawaii was annexed and in the same way that we are now holding on to the Philippines, so will Mexico come under the control of the United States. American imperialism, however disguised behind altruistic policies, is not very far behind the imperialism of other strong nations.

The United States is now in political or economic control of Cuba, Haiti, Santo Domingo, Panama, Nicaragua, Honduras, Salvador, Columbia, Ecuador, Peru, Bolivia, Guatemala, Costa Rico and Mexico.

In voicing a strong protest against this imperialistic tendency, Mr. Samuel Inman, speaking before the Institute on International Relations at Chatauqua, said that:

"Out of the twenty Latin American republics, half of them now have their financial policies directed by North Americans officially appointed. Six of these ten have the financial agents backed by American military forces on the ground. This includes Cuba, which has no official financial advisor, but General Crowder has so acted during recent financial readjustments.

"Four of the remaining half of these southern countries have their economic and fiscal life closely tied to the United States through large loans and concessions, which give special advantages to American capitalists. This leaves the six countries of Brazil, Argentina, Chile, Uruguay, Paraguay and Venezuela as the only ones outside the circle of North American financial control.

"Along with this economic and military dominance goes a dominance in the internal affairs of Latin America. In the Caribbean especially the word of the American minister is the most important factor for any government to consider. It is impossible for any one who has not come into close contacts with these countries to realize how completely their governments are held in the hollow of the hand of the state department at Washington.

"No one objects to North Americans doing business with Latin America or making loans to them, so long as the dealings are honestly carried on and government machinery, paid for by all the people, is not used for the protection of individual (private) property or for dictating the internal policies of a friendly nation. In the present economic age the United States and the nearby Latin American countries must necessarily have close relations. Latin America needs the concentrated capital of this country to help them develop their natural resources. We need the oil, the sugar, the bananas and other products of Latin America to feed our people and our factories.

"But the business of having our battleships trailing around after our bankers, onr diplomats doing the bidding of our oil kings, and the whole power and prestige of this great democracy used to discredit its people, by jamming down the throats of a weak people constitutions, treaties, and agreements which only the bayonets of the marines make them accept—this is the business that makes a red-blooded American's blood boil, as he sees it while traveling in the Caribbean these days.

"Corrupt officials in Latin America are often willing to accept a 'rake-off' for an unusually good concession to the foreigner. Or loans at an exorbitant figure, pledging the resources of the country that ought to be sacred, are made by a government to keep itself in power. These loans, often against the wishes of the people, are floated at the instance of foreign bankers to make improvements which are all right in themselves but which poor countries had better deprive themselves of rather than to mortgage their future. The people of Salvador and Bolivia have strenuously opposed for years the loans which were finally consummated by selfish officials and insistent bankers.

"Another matter to clarify is that the frequent revolutions in Latin American countries are as often fostered by outside influences as by native inability for self-government. Revolutions in Mexico and Central America have been so often fostered by North American concession hunters that in a revolution like the recent one in Honduras, foreign ramifications are very likely to be suspected, even if none appear on the surface.

"The continuance of this dollar diplomacy means the destruction of our nation just as sure as it meant the destruction of Egypt and Rome and Germany and all the other nations who came to measure their greatness by their material possessions rather than their passion for justice and by the number of their friendly neighbors. Some day the worm will turn. Burdens like we are pushing on these weak neighbors will cause them and whatever friends they can find to turn against us."

Here we have all the symptoms of peaceful penetration which world history tells us are simply the preliminary steps towards the ultimate annexation of a weak country by a stronger neighbor. The argument is reinforced when we turn to our attention to

American tendencies in the Orient. Go to Manila and advocate the fulfillment of our national pledges to concede independence to the Philippine Islands or urge in any way that our control be surrendered, and the resident Americans probably would hustle the daring orator down to the end of Pier VII and drop him into the waters of Manila Bay with the admonition to swim back home.

The same state of mind can be seen amongst Americans in China, who labor under the hallucination that in some way this country is under the sole protection of the United States, that it is our heaven-sent obligation to intervene in its affairs single handed and remodel its government and finances along American lines under the direction of American advisers.

This tendency to seek outlets for an increasing population and hold the allegiance of the emigrant is a constant provocation for future wars, and if the predictions of Dr. Henry Pratt Fairchild come true, universal peace is merely a dream of the pacifists. Dr. Fairchild predicted that the United States by the year 2050 will have a population equal to that of the entire world to-day, in other words, he invites attention to a problem that will confront the United States—which can be solved only by an aggressive war, in the event Americans refuse to foreswear their allegiance when they change their residence.

While far-sighted Americans are looking ahead to the day when national expansion will become necessary and are advocating an armed peace to protect the country against the possible aggression of other less fortunate peoples, Japan silently accepts the verdict of the western world and is seeking an outlet for her surplus millions in such lands as yet remain open to them. A new commission headed by the minister of foreign affairs has been created by the Japanese government to make an exhaustive study of the emigration problem and report on the best places in the world suitable for colonization. The initial meeting of this commission took place recently in Tokyo and although it is too early to anticipate its final report, there is reason to believe that it will favor the emigration of Japanese to South American countries rather than Manchuria, Mongolia or Siberia. Economic conditions in these territories which prohibit Japanese competition with the native laborer and farmer, the rigorous climate and the existence of extra territorial principles within Chinese territory, will undoubtedly influence the commission to approve of an outlet in South America.

The empire, although self-supporting is over-populated, undernourished, unorganized and poorly equipped to meet the competition of the west. Sixty per cent. of Japan's labor is engaged in agriculture and until a higher standard of efficiency is attained in her manufacturing methods, there is little hope that her surplus population can be absorbed into industries. Japan is up against one of the hardest problems that ever confronted any nation in the history of the world, and she is doing her best to overcome her difficulties through peaceful and legitimate methods. That Mexico, Central and South America will be called upon to receive her surplus, seems a foregone conclusion.

Mexico is already extending a welcome to Japanese immigrants and there is reason to believe as time goes on, the Japanese will favor this country as an outlet above the other Latin American states. Now it is a foregone conclusion that every Japanese who settles in Mexico will absorb the natural enmity of the Mexicans for their " Gringo " neighbor. Add to this the national rancor against America held by the average Japanese and it is easy to forsee the trouble this combination can make for the United States, especially when Americans are forced to seek their outlet in the same territory.

Commenting on this probable development, the *Natchez Democrat* asks :

" To what extent is this Asiatic colonization scheme in Mexico going to trench upon the Monroe doctrine ? How far could we permit it to proceed without endangering an established sovereignty on our southern border ? To what extent would Japanese dominance in Mexico endanger our own safety ? To what extent are the Japanese protected in this Mexican enterprise by the terms of the four power treaty ? Under that treaty, would we be compelled to submit the Monroe doctrine, in case of a difference of opinion between the United States and Japan, to Great Britain and France, the other two powers in this Pacific pact ?

"These are large questions."

Yes, these are large questions and if the trend of Japanese immigration is towards that part of America south of the Rio Grande, and they arrive there in large numbers before the inevitable influx of Americans, it is not very difficult to visualize the future. The future of the immigration or racial problem is far from rosy.

Quo Vadis

The Penalty of Isolating Japan

EVER since the Washington conference, Americans, Japanese, and British have been busily seeking to find out which nation " did " the other two, says the *Minneapolis Tribune*. A number of American writers have set out to prove that the Americans were taken in by the Japanese. A number of other American writers have set out to prove that the Americans were taken in by the British. Japanese writers on the other hand, have sought to show that the Japanese were taken in by the Americans while British writers have sought to show that the British were taken in by the Americans. It is always natural for a given national to suspect that his own nation is fleeced. The opinions of a neutral outsider, therefore, possess a real interest. The German Admiral Holman, writing on " Sea Power and World Politics, " states bluntly his conclusion that Japan got the worst and Britain the best of the Washington bargain.

" As a result," says Holman, " England left the conference mistress of the seas, especially when we consider her advantage over the United States—obliged to defend a long coast-line on two oceans—her naval bases strategically placed over the whole globe, her long maritime tradition, and the greater efficiency and better quality of her fleet. Japan's naval status was further impaired by the restoration of Shantung to China, and by her engagement not to fortify her outer islands—as an equivalent for which the United States agreed not to fortify any islands in the Pacific except Hawaii. Last of all, a final setback was given to Japan's ambitions by the substitution of the meaningless four-power treaty for the really significant Anglo-Japanese alliance. By this treaty the United States, England, Japan, and France formally agreed to settle all controversial questions relating to their common interests in the Pacific by public negotiations, and to act together in defending those interests from outside attack. Whether they anticipated such attack from the Bolshevist navy, the Mexican, or the Polish navy, has never been clear to me. Thus the Washington conference resulted in a complete surrender of Japan to the Anglo-Saxons."

Holman's opinion is in complete harmony with our own, supporting our contention that the one weak spot in the Washington treaties was the failure to provide Japan with some compensating advantage for the surrender of the defensive pact with Great Britain which owed its origin to forces menacing their mutual interests in Asia. As it is, Japan has been stripped of all strategic advantages acquired as the result of twenty years of unremitting vigilance and sagacious diplomacy, deprived of support from Great Britain against her traditional Asiatic foe and left in an isolated position to face her future without any guarantees that her western associates will come to her assistance in the event her vital interests are again placed in jeopardy.

It is just this situation which provides American strategists with the arguments to support their plea for greater military preparedness. Japan's isolation in Asia may well lead to recognition of the Soviet followed by closer relations that may develop into some understanding defining their respective rights and positions in Eastern Asia. For the present the Japanese statesmen directing the policies of the empire strongly favor at any whatever sacrifice the closest relations with America, but on the other hand there is an equally influential element which advocates a renewal of the old understanding with Russia. The whirligig of politics may bring this element into power in some of the frequent cabinet changes and compromise the future policies of the empire along lines that will cause uneasiness to other powers.

At the head of the pro-Russian group stands Viscount Goto, one of Japan's foremost statesmen and administrators, who bases his plea for a closer understanding with the Soviet on clear cut economic arguments arising out of the population problem. He does not dread free intercourse or closer contact with the Bolshevists but comes to the point and says that the prevention of dangerous thoughts and labor unrest in Japan depends entirely on the solution of the population and food problems. He says that if the population continues to increase at its present rate without a corresponding increase in the food supply a terrible disaster is bound to follow. The pressure of population on the national food supply will compel the people to fight for food by appealing to brute force. The future of Japan in his opinion depends on the further and more perfect industrialization which will enable the national economy

to support a greater population, obtaining food from foreign countries in exchange for exported manufactured products. This, he says, is the key to the solution and nothing else and to enable Japan to expand her industries the closest relations with Russia are imperative to obtain much needed raw materials and furnish a market for the manufactured articles. Close relations with Russia means in the last analysis close relations with Germany. It means a new line-up in which Japan's economic sphere in Manchuria and Mongolia will not be imperilled by any aggressive move on the part of Russia, a line-up somewhat at variance with the policies of the other western powers with whom Japan is now in such accord. Any further attempt to close the doors of American countries to Japanese immigration, a possibility that must be faced if they seek homes in large numbers in that part of the world, can only tend to throw Japan into the arms of Russia and Germany.

The problem becomes more and more complicated when it is seen that Viscount Goto's remedy is one extremely difficult to put into practice. For the present, Japanese manufacturers are unable to hold their domestic market against foreign competition owing to the high costs of labor and manufacture. Only by a radical return to a pre-war scale of wages and improvements all along the line in manufacturing methods can Japan lower her costs and hope to compete for foreign markets with the rest of the world. Until this revolution in existing economic conditions takes place, Viscount Goto's plan will hardly help to solve Japan's d fficulties. In the meantime, the population keeps mounting up and there is no place for them to go in large numbers except South America or Asiatic Russia.

Undoubtedly it is this complex situation which influenced Major-General Harbord, former deputy chief of staff of the American army, to point out at a recent Chautauqua meeting that the "Colonial future of Great Britain, France, Holland and Japan, may most vitally affect the United States. Not all the great powers were parties to the Washington conference. China, Russia and Germany are politically in an uncertain state. Giants az stirring restlessly in their slumbers and may be dreaming dreams.

"Our unhappy manner of doing a thing we had a right to do may have lost us the warm friendship of Japan. Russia and Germany will not remain content excluded from the Far East. Japan has grievances, real and fancied.

"What would a German-Russian-Chinese-Japanese combination do to the peace of the world ? What could withstand a union of white, yellow and brown gathered from the Rhine to the China Sea, and what is there impossible or even unlikely in such an alliance ?

"With all the Latin-American States in the league of nations, can we maintain the Monroe doctrine with these countries south of us carrying their disputes before that political organization for settlement ? "

To which we add, especially if our Asiatic exclusion policy and the recommendation of Japan's emigration commission forces the Japanese surplus into Mexico and other states of Latin America. In the event that some South America government enacts an exclusion law or enforces legislation depriving Japanese colonists of their lands after developing them to a high state of productivity, will the United States forego its conception of the Monroe doctrine and permit the dispute to be settled by an international court or the league of nations ? In the event that 200,000 or more Japanese settle in Mexico or some other country to the south of the United States where their presence precipitates some situation that would demand the intervention of the Japanese government, would America invoke the Monroe doctrine and warn Japan to keep her hands off ? If, at every turn Japan is confronted with the antagonistic policies of the United States in her peaceful efforts to find an outlet for her people, would she not be justified in linking her fortunes with the combination of powers mentioned by General Harbord ? Time alone will tell, but as General Harbord wisely points out—what is there impossible in such a line-up ?

* * *

Luxury or Life

As might be expected a certain section of the American, British and Chinese press has assumed a belligerent attitude over the new Japanese tariff which places a duty of 100 per cent. *ad valorem* upon luxuries. Some of the more rabid Journals even go so far as to say that this was the real boycott of American goods which some of the ardent Japanese had threatened to invoke, a boycott made efficient by government rather than private action. The latter argument can be disposed of without difficulty in view of the protest from certain British quarters, notably the federation of British industries, to the board of trade, which complains that British trade will be hampered and exports of some products that enjoyed quite a sale in Japan will be forced to drop out of the manifests of steamers bound for Nippon. Therefore it would appear that no nation is especially hit by this luxury tariff, but that all suffer equally, the Japanese themselves being hardest but since those who have come to depend on imported goods of the " luxury " classification, must find some home-made substitute or go without.

But the matter goes far deeper than the superficial view of the countries principally affected. The Japanese standpoint must be considered first and foremost. For many months, ever since the great disaster of last year, Japanese statesmen have been noting with concern the rapidly increasing adverse trade balance. Despite the rise in price of silk, Japan's greatest export item in her trade with America, the falling off in volume in this product has been astounding, due to decreased demand by United States weavers of silk textiles. Coupled with this decrease has come the enormous demand for materials with which to rebuild the shattered cities in the quake and fire zone, so that Japan has been caught, as it were, in the pincers of a giant claw—and both mandibles hurt. It is impossible for Japan to force her silk on a declining market, better wait a bit until the demand nears normal again, and it is just as impossible for Japan to stop buying the iron and steel and wood and other structural material needed to rehabilitate her cities and help her millions to return to normal industrial life.

Japanese statesmen have been trying for years to drive home to their people that they must become a great industrial nation so that the factories may provide sustenance for those whom the fields are not wide enough to support. This idea has been intensified since the disaster and the leaders of national thought were not slow to see an added argument in the boycott of foreign goods that was mooted after the passage of the exclusion act by the United States congress. The luxury tariff was not born then, but it came to a focus due to concentration in the two lenses—that of adverse trade balance and a " buy Japanese products first " movement that was a logical outcome of the collapsed boycott. This was entirely reasonable and while some Japanese and practically all foreigners in Japan chafe under it, the outcome doubtless will be a speeding up of Japanese industry such as the nation has not seen since the early days of the war.

Historically considered, Japan's anti-luxury tariff has a noteworthy precedent, that of Sparta where they went so far as to make their money of iron so that no one could carry much of it. Sparta's object also was two-fold. In her case she feared effeminacy due to the example of Athens and a corresponding lowering of her military power. Also she needed, just as does Japan, to conserve her resources not because of a past calamity, but to avert calamities that cast gloomy shadows of forboding over the souls of Lycurgus and Draco. As a matter of fact, Japan's fears are along neither of those lines although luxury from a western standpoint is rather a recent growth in Japan, yet it doubtless received a great stimulus from those *nairikin*, the new-rich of war prosperity, so that there may have been an idea in the back of the minds of the framers of this luxury tariff, that a return to former simple standards of living would not be a bad thing for the nation as a whole. That this was not the principal or even one of the prominent objects of the tariff law is quite evident in that Japan makes many of the so-called foreign luxuries herself and the expansion of these native industries, by keeping considerable sums at home that have been spent abroad, will augment considerably the internal prosperity of the country and increase its revenues to an extent that will enable the absolute necessities to be bought from abroad without pinching or lessening the national credit.

But that laudable ambition on the part of the Japanese does not lessen the discomfort with which certain manufacturers of other nations view the new enactment. " Unequal treatment of various nationals " is charged against Japan by the general chamber of commerce of Shanghai which calls upon the foreign office to lodge protest with Japan against the immediate enforcement of the new luxury tax as regards Chinese products, while a bathering space has been granted certain western nations.

The telegram reads : " Recently the tax on luxuries in Japan was increased, and while the Japanese government promised several countries, including Great Britain, Germany and Belgium, to postpone its enforcement, nevertheless the tax is collectable at once on Chinese goods. Thus their policy of pleasing the strong and abusing the weak is obvious to all.

" If this unfair treatment be not cancelled, how can Chinese merchants trade in that country ? If the government authorities do not protest, how can it be called the protector of its merchants ? Moreover, this changing of taxation is quite contrary to the principles of the Washington conference. The different institutions in Shanghai when hearing this news are greatly agitated.

" It is well understood that on one side, Japan is puffing its friendly policy toward the Chinese but on the other is trying to abuse the Chinese residents or merchants there with the utmost effort. All the cruel laws and harsh regulations are being tried out on the Chinese. In this recent increase of the luxury tax, hundreds of kinds of goods are included. If this be enforced, how can Chinese merchants trade in that country ? "

Other nations object, not quite so ingenuously perhaps, but all seem to think their own national toes are trampled upon, refusing to see the plain truth that Japan would curb her luxury loving population and make them keep their money at home.

* * *

Japan On the War Path

As Seen from the Eiffel Tower

PARIS has recently become the distributing centre for disquieting news about Japanese policies and preparations for war and we are beginning to get an accurate line on the origin of much of the anti-Japanese publicity manufactured and spread broadcast by international news services whose effect can only help to make Americans skeptical about Japan's intentions in the Pacific. Two months ago we were regaled with the oily story originating in Paris of the existence of an alleged secret understanding between Japan and Russia in which the former was to furnish the Soviet with its old war-ships together with huge quantities of artillery and ammunition in exchange for oil concessions in Saghalien that would assure to the Japanese navy an independent fuel supply. The inference behind the canard was that Japan considered the menace from the sea more urgent than the menace from the direction of Urga. Although this story was immediately denied from Moscow it was resurrected a month later by a British news-service and broadcasted, this time receiving an unqualified denial from Tokyo.

Shortly after we were informed by the *Westminster Gazette* that Japan had purchased 140,000 machine guns from Vickers, whose plant was working day and night to rush through the order. This also was immediately and officially denied from Tokyo. Before this story had time to cool the Paris *Temps* of August 6 published the news that

" There are being built in Italy a number of bombing planes of a German type for the account of the Japanese navy.

" These machines are entirely metal. They have a range which will permit them to fly from Japan to the Philippines and back, carrying a ton of explosives on each.

" The company which is building them, Staleria di Construzone, at Marina di Pisaqui, appears to be a branch of the Dornier Mettallabauten Corporation of Friedrichshafen. Furthermore, the Mitsubishi Company of Kobe is said to have bought the rights and patents of the German Dornier firm."

Here we are permitted to glimpse something of the real object behind this continued propaganda. Note that the range of the planes is not given in miles, but emphasizes that they can fly from Japan to the Philippines and back. Now there is nothing alarming about Japan's aerial program nor should there be anything significant in the fact that she is ordering planes from abroad or until such time as she can manufacture them in her own establishments. Nor is there anything remarkable in the fact that these planes should be models to be brought to Japan for the Mitsubishi Works at Nagoya. But the mere fact that Japan is ordering planes in Europe, built to a German model, becomes an international news sensation while news of shipments of French fighting machines to China for the use of the various war-lords is soft-pedalled. Several correspondents of American newspapers in Paris seized on the story of Japan's purchases of planes in Europe to indicate that she is building up a huge air force, which in connection with the other stories released in Paris and London about her war-like preparations are sufficient to keep the American public alarmed and provide excuses for American militarists to urge larger appropriations for defense. If Japan builds a few cruisers or submarines there are experts galore to accuse her of violating the provisions of the disarmament agreement and now that that story is squashed, behold her ordering machine guns by the hundreds of thousands and outdistancing her competitors in the air.

The aircraft story as told by the Paris correspondent of the Chicago *Tribune* who witnessed the flights in Italy is to the effect that " Bombing seaplanes of German design are being built in Italy for the Japanese navy. They are all metal machines, the latest word in military flying boats, and have a fuel radius and bomb-carrying capacity which would enable them to carry a ton of explosives from the nearest Japanese base to Manila and return.

" I have just spent two weeks in Italy observing the flying boats in the process of construction. All are equipped with bomb racks. Dozens of German and Italian mechanics are employed at this work in the shops and hangars of a large Italian aeroplane company at Pisa, while German test pilots are making trial flights over the Mediterranean.

" The Italian company is a child of the Dornier Metallbauten corporation of Friedrichshafen, which is one of the Zeppelin producing plants. The German company at present is engaged in Germany in constructing the ZR-3 airship for the American navy. The interallied air control mission, which under the Versailles treaty prevents the construction of possible war machines in Germany, is responsible for the establishment and operation of the extensive plant in Italy, but in spite of this arrangement the aeroplane parts are manufactured in Germany.

" The information was admitted at Psia that the manufacturing rights of Japan for all Dornier machines and inventions have been purchased by the Mitsubishi ship building works of Kobe, whose former extensive business of battleship construction for the Japanese government has suffered a depression through the terms of the Washington conference.

' The purchase figures are reported to be high in millions of yen. The transaction was consummated on May 10, at which time several Japanese naval officials spent two weeks at the Pisa plant, leaving one of their number, who now is overseeing the work.

" Three German experts from the Pisa factory left immediately for Kobe to superintend the erection of a manufacturing plant there. They were Fritz Bauer, factory superintendent at Pisa and a former Zeppelin official ; Hans Berger, shop foreman and metal expert, and Herman Klinger, chief of the supply and assembling department.

The Paris correspondent of *The New York World*, howerve, got the story from French sources and learns that large orders lately have been placed with Farmans for airplanes, including at least ten Goliaths—machines which carry three tons and which could fly from Paris to Morocco between sunrise and sunset.

A French military and technical mission, he says, has just returned from Japan, where it organized flying schools, factories and airdromes. Other French manufacturers have received orders from the Japanese government. The total number of machines runs into hundreds. A Japanese air mission is shortly expected in France. Already three European centres for air research have been established by Japan—in France, Germany and Italy. Recently Japan ordered three giant Capronis, the largest existing type of airplane, carrying four engines and a large number of passengers."

All this is probably true as is also the fact that Japan is keenly alive to the progress being made in the development of aviation and seems determined to become independent of foreign manufacturers by establishing her own workshops. Following out this idea the Japanese papers report the proposal of a merger of the naval construction department in the Hiroshima arsenal with the Kure naval arsenal, the combined workshop to be used as an independent factory for the manufacture of airplanes.

The conversion of the Yoyogi parade ground in Tokyo into an international aviation field, and the establishment of landing fields in Osaka and other leading cities of the nation, also are under consideration.

It would seem as though Japan was trying to keep in step with the rest of the world in aviation and that her efforts along these lines would be welcomed as a boon of progress instead of a war menace. When the Japanese see the military fliers of other nations passing over their country and war-planes of all kinds and from all countries pouring into China and foreign pilots entering the service of the various warlords it certainly behooves Japan to grow wings of her own.

Another Secret Alliance

Roosevelt's Adherance to the Anglo-Japanese Pact to Maintain the Peace of the Far East.

Why did Taft Reverse Roosevelt's Policy?

WHAT are the duties of a journalist? On September 12, I sat as an invited guest at a dinner tendered by the international journalists' association of Tokyo to Japan's new minister of foreign affairs, Baron Shidehara. In presenting the distinguished guest, Mr. Zumoto, the veteran editor of Japan, mentioned that some day in the future when the inside history of the Washington conference is written, it would be found that much of its success was due to the pre-convention labors of Japan's delegate whose intimate contact with Secretary Hughes and sympathetic understanding of his aims paved the way for the official acceptance of the basic ideas of the conference. Baron Shidehara then addressed the gathering on the duty of the press to inform the public correctly about political events. He stressed the part publicity bears towards diplomacy and international relations and how public opinion is made on the strength of what is printed in the newspapers. It was an excellent talk, but the thought came to us that it will ever be an impossibility for the journalist to live up to the high standards set for him so long as diplomats and public officials withhold vital information essential to an intelligent understanding of current events. Newspapermen are rarely permitted to peep behind the scenes of high politics and must accept the facts as doled out to them by statesmen interested in giving publicity to their own views and doings. The whole truth is rarely told and only in after years when the memoirs or private papers of some statesman are published are vital facts released, too late to have any influence in moulding public opinion of the day and interesting only to the historian. Mr. Zumoto's reference to the part played by Baron Shidehara at Washington seemed to be a case in point and tells us that not until the inside history of that memorable conference is written will the world know all the facts that led up to its invocation. With these thoughts fresh in our mind we received the following day the newspaper reports of a session of the Institute of Politics at Williamstown in which Dr. Tyler Dennett told the China Round Table that Theodore Roosevelt while president had entered into a secret compact with Japan for the maintenance of Far Eastern peace.

The "agreed memorandum," as Dr. Dennett called a document which he said had been "enthusiastically endorsed" by the President after being drawn up by representatives of Mr. Roosevelt and the Japanese government, also contained a statement that Japan had no intenion of trying to take the Philippines away from the United States, and that Mr. Roosevelt's representatives declared that Japan would be justified in establishing a military protestorate over Korea and taking charge of her foreign affairs.

Dr. Dennett also asserted that he had seen a "brief letter" written by President Roosevelt at the outbreak of the Russo-Japanese war, in which Mr. Roosevelt warned both France and Germany that if they went to the support of Russia, he would go to the support of Japan. In consequence of these two actions by the President, Dr. Dennett went on, the United States during the Roosevelt Administration, was virtually "an unsigned member of the first and second Anglo-Japanese alliances." According to Dr. Dennett, President Roosevelt prevented a world war by his warning to France and Germany.

The Dennett revelations created a sensation among the members of the institute. In a discussion following the address, Dr. Dennett was hailed on one hand as the discoverer of new historical facts of far-reaching importance, while on the other hand he was challenged to produce proof of his assertions. Dr. Dennett replied that he had been working on President Roosevelt's private correspondence for months, and that the documents he referred to were on file in the possession of the Roosevelt family. He said that he had in his possession a photositat copy of the "agreed memorandum" made on July 29, 1905, the effect of which was to place the United States during the period of the Roosevelt Administration as almost an unsigned member of the second Anglo-Japanese alliance. This agreement took the form of 'an agreed memorandum,' and had the complete endorsement of President Roosevelt. Although it was negotiated through regular diplomatic channels or by a member of the Department of State, the substance of this agreement was as follows:

"In the course of the conversation the American representative of President Roosevelt remarked to the Japanese, "I suppose that you do not desire to take the Philippine Islands away from us.' The Japanese replied that he was glad to assure the American government that Japan had no such desire or intention, and that Japan would be best satisfied to see the United States remain in the Philippines and establish and maintain a stable govenment.

"The Japanese representative then said in substance: 'You realize how difficult it is to preserve the peace of the Far East. There is danger that following the conclusion of the Russo-Japanese war, Korea will lapse again into a condition of anarchy. We are aware of the provision of the American constitution which make alliances so difficult, but it seems to us as though it would be possible for the United States to enter into a secret agreement with Japan and England for the preservation of the peace of the Far East."

"The American replied that under our constitution such a secret agreement would be impossible. However, he thought he could assure the Japanese government that the American people would be glad to act with the Japanese and British people for the preservation of the peace of the Far East.

"The Japanese representative then inquired of the American representative what, in his opinion, Japan should do with reference to Korea. The American replied that in his judgment Japan would be fully justified in establishing a military protectorate over Korea and in taking charge of her foreign relations.

"This document was approved by President Roosevelt only twelve days before the formal publication of the terms of the second Anglo-Japanese alliance, and two weeks before the opening of the Portsmouth Peace Conference. This action of President Roosevelt did not stand alone.

"At the outbreak of the Russo-Japanese war, eighteen months before, President Roosevelt had been so impressed with the possibility that France or Germany, or both, might go to the support of Russia against Japan that, according to his own statement, in a brief letter which I have seen, he warned both Germany and France that if they went to the support of Russia he would go to the support of Japan and 'take whatever steps necessary for her protection.'"

"It will be recalled that in the first Anglo-Japanese alliance, signed in 1902, this was the obligation which had been assumed by England. We may, therefore, say that this warning, which came personally from Presiden Roosevelt to France and Germany, had only the value which attaches to the personal declaration of the President of the United States. Nevertheless, the effect of it was to make the United States assume substantially the same responsibility toward Japan which England had assumed in the first alliance.

"Putting together these two actions of President Roosevelt, we may see roughly that the United States during Roosevelt's administration was, so far as the action of the President could make it, an unsigned member of both first and second Anglo-Japanese alliances. The obligation was, of course, not binding on other administrations and was in fact ignored by President Taft and Secretary Knox in the proposal for the neutralization of the Manchurian railways in 1910.

"This action on the part of President Roosevelt would appear to have very great significance in any study of recent foreign policy of the United States. President Roosevelt was perhaps the first American statesman, certainly the first since Seward, to perceive clearly that the Far East question is largely a phase of European politics.

The Russo-Japanese war had its origin quite as much in Europe as in the East. President Roosevelt appears to have realized that the most certain way to safeguard American interests in the Far East was to enter European policies and declare American willingness to bear its full share of responsibility for the preservation of the peace, not merely of the Far East, but of Europe and the world.

" At the beginning of 1904, as is clearly revealed in the private papers of President Roosevelt, as well as in the contemporary literature of the time, Europe was dangerously close to the brink of a world war. France was allied to Russia, England was allied to Japan. Four powers were paired. Germany had urged Russia into the war with Japan, and her future policy was then a matter of doubt and grave concern.

" When President Roosevelt threw in the weight of his influence by his warning to France and Germany, he localized the conflict in the Far East and quite possibly prevented the outbreak of a European conflict. It would therefore appear that the policy of co-operation with foreign relations in international affairs cannot be called a partisan policy. It is one which has been as ardently advocated by Republican as by Democratic leaders.

" Indeed, we may wonder whether in years to come it will not be regarded as Roosevelt's greatest contribution to American statesmanship that he so perceived the necessity of American participation in European politics. The situation in the summer of 1905 is such as to make it seem quite plausible that if President Roosevelt had not made this engagement with Japan and England it would have been far more difficult and perhaps impossible for him to mediate the peace of Portsmouth a month later."

Dr. Dennett's statements were corroborated the following day by Dr. Charles Moore, life-long friend of the former president and now custodian of the Roosevelt collection of papers and letters. So here we have another belated contribution to Far Eastern history permitted to leak out informally twenty years after the event. Count Witte's memoirs and the frequent references to the secret Sino-Russian treaty of alliance in the pages of this magazine probably influenced the Chinese delegation to break the seal of official secrecy surrounding this instrument and file a summary of its text with the Washington conference. The facts surrounding that treaty and its bearing on subsequent events completely reverses the accepted version of modern Far Eastern history and this new revelation of secret American diplomacy taken in connection with other belated facts will further help to straighten out the tangled skein of misinformation that has for so many years befuddled the minds of Far Eastern journalists.

It seems improbable that such a firm attitude on the part of Roosevelt towards Far Eastern affairs was concealed from his cabinet, especially his secretary of war, and the question is bound to arise why the latter as his successor, reversed his policy. Some day, perhaps long after his demise, the papers of President Taft may shed light on this highly interesting question and until such time the historian can only fill in the gaps and draw deductions from existing state papers and the letters of Willard Straight. The complete reversal of Roosevelt's friendly policy towards Japan by his successor in office would seem to call for an explanation on the part of Mr. Taft, for until he clarifies the situation, the student of Far Eastern history basing his impressions on Straight's revelations must incline to the belief that America's sudden change of front was influenced by Harriman's determination to gain control of the South Manchuria Railway, using the power of the state department to achieve what he could not accomplish by open and private negotiation. The cold, hard facts surrounding the origins of American policies in Manchuria and our hostility towards Japan dates from the Russo-Japanese post-war period having its inception in the Manchurian negotiations between Willard Straight and Tang Shao-yi. The policy of Roosevelt was reversed and from being an ally and ardent supporter of the Anglo-Japanese understanding we swung around and became over night a bitter political antagonist. There must be some excellent explanation to account for this sudden change and until Mr. Taft takes the nation into his confidence, the impression will remain that the change was ushered in with the " dollar diplomacy " of Secretary Knox.

Coming back to the subject matter of Baron Shidehara's address, it is difficult to see how the journalist can hope to mould public opinion when such vital facts are concealed from him by the operation of secret diplomacy. As a consequence of policies whose origns remain hidden, America and Japan drifted apart until actual war stared the two countries in the face, taxing the ingenuity of the diplomats of each country to find an amicable solution of their difficulties. Having found such a solution they take the credit for it and censure the newspapers for having created the misunderstanding.

It is brought home to us that in so far as Far Eastern affairs are concerned much of the present bitterness of feeling could have been avoided had the diplomats taken the journalists into their confidence instead of using them to advance their own plans and give publicity to their idea of what constituted national interests. Even at this late date a little more confidence in the press in matters concerning Far Eastern affairs would materially assist in clarifying the international political atmosphere and make for better relations. It is to be hoped that we will not have to wait another twenty years before our grandchildren are informed of facts which have a direct and vital interest for the present generation.

G. B. R.

* * *

American-Japanese Co-operation

The Industrial Bank of Japan Obtains a Loan of $22,000,000 in New York

ONE of the most interesting and significant international financial transactions of the past year was the successful flotation by the National City Company of New York of a loan to the amount of $22,000,000 to the Industrial Bank of Japn, Ltd., for the general purposes of the bank's business. The notes are dated August 15, 1924 and mature in August 15, 1927, redeemable in whole or in part at par and interest on thirty days notice beginning August 15, 1926. They carry interest at six per cent. and were offered to the public by the National City Company at 99¾ to yield more than 6.27 per cent. The whole issue was oversubscribed within twenty-four hours after the subscription books were opened.

Coming so soon after the successful flotation of the $30,000,000 loan for the Daido Electric Power Company and the previous issue of $10,000,000 for the Oriental Development Company, the transaction indicates that American bankers and investors have the fullest confidence in Japan's economic condition and reject the arguments advanced to obstruct closer financial relations between the two countries.

The Industrial Bank issue is of special importance as it bears the unconditional guarantee of the Imperial Japanese government as to principal and interest by endorsement on each note and the further guarantee that the notes will be payable in time of war as well as peace, irrespective of the nationality of the holders and that principal and interest will not be subject to any present or future Japanese taxes. The phrasing of the loan agreement, unique in American finance, was brought about by the recent United States immigration law and the fears on the part of American investors that a war between the two countries is a possibility at some time in the future. The wording was such as to appease these fears and it was learned that the Japanese government was so desirous of having the funds raised in the United States in order to show its friendly feeling that other foreign bankers were not even invited to bid for the issue.

Another feature of the issue which has elicited general interest is the close connection between the bank and the Japanese government. The Industrial Bank of Japan was created in 1906 by a special act of the Japanese diet upon the initiative of the government for the purpose of developing the economic resources of the empire through the purchase or underwriting of specified classes of securities, including rails, hydro-electric, sanitation projects, etc. The bank enjoys certain privileges but in turn is under close governmental supervision. The government appoints the president, vice-president and directors and a special government controller who acts independently of the bank's auditors elected by the shareholders. Among the recent issues underwritten by the bank are those of the Oriental Development Company, South Manchuria Railway Company, Great Consolidated Power Company, Ltd. and the City of Tokyo.

The Industrial Bank of Japan also headed the group composed of the Bank of Taiwan, Bank of Chosen and the Hypothec Bank, all semi-official institutions, which advanced over Y.100,000,000

to the Chinese government during 1918 and form part of what are generally known as the "Nishihara Loans." China has since attempted to characterize these loans as illegal and has refused to pay the interest amounting to eight per cent. per annum. Owing to this failure on the part of China to meet her obligations the banks concerned have been compelled to protect their clients by advancing the interest from their own reserves. It is no secret that this burden placed the Bank of Chosen and the Bank of Taiwan in an embarrassing financial position and that the load has been carried in large part by the Industrial Bank as head of the group. The campaign on the part of China to discredit these loans and justify the default of interest has been practically defeated since it is known that the American loans to China are in the same classification. If one group of loans is illegal, so are the others.

It is understood that ninety per cent. of the bank's business is in Japan and the balance in China. There is little doubt that the present loan will enable the Industrial Bank to carry its Chinese business until such time as conditions in China warrant a general reorganization of its finances, when the loans of 1918 will be included in the funded indebtedness with some tangible security behind the bonds. For the present however, the American banker is eminently satisfied with the unconditional guarantee of the Japanese government to the Industrial Bank notes and to the broad statement that the loan is for the general purposes of the bank without any qualification. It is a long step forward towards further Japanese-American co-operation.

The success of the Industrial Bank issue bears out the defense of the much maligned international banker so ably presented before the Institute of Politics by Dwight W. Morrow of J. P. Morgan & Company. In his statement Mr. Morrow pointed out that 11,000 persons bought the $25,000,000 of Austrian bonds sold in America and that 48,000 bought the $150,000,000 Japanese bonds. The international banker, he pointed out, is merely the middle-man who underwrites and sells the bonds to the public. He has to believe in the bonds himself, in the value of the security and the general good faith of the borrower. The easy money conditions with vast quantities of funds available for investment makes the United States at this time the most natural market for the flotation of foreign loans and now that our bankers are convinced of the sincerity, solvency and friendly intentions of Japan, they are quietly building up an edifice of good-will that will do more to ensure peace in the Pacific than all the protocols, conventions and treaties that have been signed to date having this object in view.

With the recent Industrial Bank issue, American investors now hold over $212,000,000 of Japanese securities, all subscribed for in the past year. These bonds are probably held by over 100,000 investors and there is every reason to believe that the coming year will see this amount greatly increased by further issues for large Japanese development schemes. We know of no better guarantee for peace and amicable relations and for this we are indebted to the international banker. The theory that international bankers instigate wars for the purpose of collecting unpaid or defaulted debts or lend money for the purpose of provoking hostilities is an absurd one. The banker knows better than any one else how poor a weapon war is for that purpose, He controls a better way for regulating world affairs, the reverse of the accepted theory. His weapon is to refuse financial assistance to those governments who fail to measure up to his standards. The effectiveness of this weapon is driving the Soviet into line, with the rest of the world. It has taught Mexico a lesson and in due time will have its full effect on China. The more American money flows into Japan for investment with or without government guarantees, the more close will become the financial and commercial co-operation between the two peoples; the greater are the possibilities for a continuance of those friendly relations and that mutual esteem which will help to keep down the cost of armaments. American co-operation with Japan in financing the development of Manchuria and Mongolia and carrying out the plans of the South Manchuria Railway Company will also contribute towards this much to the desired end. American co-operation along these lines with Japan is the surest guarantee that China's rights and sovereignty will be fully respected. There are indications that American bankers are beginning to grasp the truth of this statement by a willingness to lend money to Japan for development work in these territories.

The Hon. Mr. A. G. Stephen

(Continued from page 414.)

There was a time, during the war, when actual coined dollars were needed—and needed badly. Mr. Stephen sent out a request for the specie and it came pouring in from Chinese and foreign sources as well, until the crisis not only was past but the bank's vaults were overflowing with specie. No premium was paid for none was asked. The Bank wanted the dollars, and there they were.

Mr. A. G. Stephen's connection with the Bank extends back to 1885 when he arrived in Hongkong as a junior; but within a year he was transferred to Batavia. After nearly six years' service there he had two quick transfers first to Singapore and then to Bombay; in 1896 he returned to Batavia as accountant. In 1902 he was appointed agent at Penang and in 1906 was promoted to manager, in which capacity he served for five years. Prior to taking over charge of the Shanghai branch from Mr. H. E. R. Hunter he was inspector of the North China branches, in 1911.

Manager in Shanghai

In the spring of 1911 he came to Shanghai and assisted the late Mr. H. E. R. Hunter in the management. A year later he succeeded on Mr. Hunter's retiring and remained manager in Shanghai unitl April, 1920. During this time he had many most anxious crises with which to deal, including the terribly anxious week of revolution in 1913, and the financial crisis of May 1916, when the Chinese government declared a moratorium which very nearly threw the Chinese bankers into hysterics. On all these occasions Mr. Stephen's calm and dominating personality was of incalculable value in keeping the local market steady. Chinese bankers were deep in admiration for him and, on his going Home in 1920, they presented him with several valuable testimonials. It may also be recalled that at the end of the war, the diplomatic body in Peking unanimously invited him to liquidate the Deutsch-Asiatische Bank, which was done with thoroughness.

Among other recollections, it was Mr. Stephen who proposed that if the Chinese government would establish in Shanghai a properly managed and controlled mint, which should coin dollars of stable value, other provincial mints being abolished, foreign banks would be prepared to accept these dollars as the coinage of the country and keep their accounts in them. We know the fiasco in which the project ended, but that was not Mr. Stephen's fault. He also took no little trouble for the formation of a bankers' association in Shanghai, which would have included both Chinese and foreign banks, but in this he could not bring all concerned into line. It may also be mentioned that he was very strongly in favor of the municipal council issuing its own coinage in order to counteract the evil of depreciated copper; this idea was scoffed at when he advanced it, but one has since heard it advocated since in several different quarters.

Chief Manager

In April, 1920, Mr. Stephen went Home for eight months' leave in the same ship with Sir Havilland de Sausmarez and Dean Walker. He returned a year later to Hongkong as chief manager, and under his charge the prosperity of the Hongkong and Shanghai Bank has certainly "moulted no feather." In illustration of Mr. Stephen's breadth of view, it may be mentioned that the great Wayfoong building in Shanghai was almost entirely due to his advocacy: left to themselves, the cour of directors would probably have built something much more modest. Mr. Stephen had great ideas of embellishing the old bank house in Hongkong. It was due to his influence that the court of directors purchased the wonderful collection of Chinnery's drawings and paintings, when they came into the market a few years ago, which now hang in that house. He also bought, out of his own means, not a few pictures and handsome pieces of furniture, to present to the chief manager's house. He was for several years a member of the legislative council of the governor of Hongkong.

THE HON. MR. A. G. STEPHEN

Late Chief Manager, Hongkong and Shanghai Banking Corpraotion

CHINA has lost one of its best known British residents, a brilliant businessman and a charming social figure, through the death of Mr. A. G. Stephen, chief manager of the Hongkong and Shanghai Banking Corporation, who died in London, August 27. The news came as a profound shock to a large circle of close personal friends, officials and members of the whole business community of China, Mr. Stephen having had that rare power of making a personal friend of practically every person with whom he came in contact whether he granted or refused the banking favors they asked. No man in similar position will be more sincerely mourned, for his unerring

"A man whose knowledge of business and finance is unparalled and whose services to the Empire and its Eastern connections are well-known."

judgement of men and his quick estimation of character as an asset brought many to help strengthen the Bank after he had enabled them to find their financial feet.

So far as a banker can be, he was a philanthropist. The business that went on the rocks through no fault of its own always found in him a kindly counsellor and, if honesty as an asset was in sight, a generous creditor. Had he died in Shanghai, the man who failed to be present at his obsequies would have been looked upon askance for the men and firms he aided were legion. No banker in Shanghai ever had more loyal supporters—and this does not refer only to foreigners.

(Continued on page 413.)

The War in China

B.C. 2000—A.D. 1924. The Same Old Story

By Our Special War Correspondent at the Front.
With Apologies to J. P. O. Bland.

THE long heralded war in China is on. Far Eastern newspapers are devoting columns of space to the most insignificant details of troop movements, engagements and the opinions of experts. A new group of war correspondents has appeared on the scene regaling the public with censored news fresh from this or that G. H. Q., from " the front " or from behind sectors or trenches. The vocabulary of the world-war has been revived and is working overtime. The Chekiang army has "dug itself in," artillery duels and machine gun fire make a realistic setting for bombing and scout planes and red cross activities. It is all very thrilling and just as the war began to grow really interesting and there was hope of a decisive battle in the Shanghai sector, the inevitable happened.

Two of Marshal Lu's division generals operating on the Fukien border sold out to the other side accepting a defeat after a sham battle and retired, finally turning altogether and joined with the enemy to march on Marshal Lu's capital at Hangchow. Threatened from the rear and with his loyal troops holding their position along the extended battle front a hundred miles away in the neighborhood of Shanghai, the Chekiang war-lord had no option but to hurriedly pack up his wives, his children, art treasures and chests of silver sycee and beat a hasty retreat forward to the safe shelter of his G. H. Q., at Lunghwa in the environs of the model settlement. The war as far as Chekiang is concerned is over.

Meanwhile the battle rages, and the sound of the heavy artillery and machine gun fire is wafted to the ears of the foreign community in Shanghai who patiently awaits the outcome.

It is difficult and unwise to anticipate events and prophecy which side will win. The story of the war, however, is another matter. It was accurately reported years ago by a competent war-correspondent who described every move that has been made to date. We are going to permit J. O. P. Bland to tell the story of the present war in China which differs very little except in names, dates, places and the arms used, with the campaign of Field Marshal Wang Sun-ki against the King of Wu in the year 2000 B.C.

Mr. Bland tells the story of the war in his most interesting book published years ago entitled "Houseboat Days in China." Substituting Kiangsu and Chekiang for the kingdoms of Wu and Han the story is still true to form and present conditions. The modern newspapers controlled by the contending governments now do the shouting and hurl imprecations at the other side while the lineal descendants of Wang Sun-ki eat and make merry at the festive board while they conclude the arrangements for selling out at the proper moment. Mr. Bland says :

* * *

" In the year B.C. 2000 or thereabouts, there was no such thing in the Far East as the ' fortune of war '—at least, not in the sense in which we use the phrase to-day. There were fortunes in war, as will presently be seen ; but its glorious uncertainties, its reverses and surprises, had ceased to exist. The winning and losing of battles had been reduced to the simplicity of a multiplication sum, all of which was due to the genius of one great man, General Wang, to wit, field-marshal of the forces of his Majesty Chang Wu, King of the Hans.

"At that period China was divided, like Gaul, into three parts, and ruled by three dynasties known respectively as the Han, the Wei and the Wu. Buffer states were unknown in those good old days, and the three kingdoms aforesaid were always in a healthy state of active hostility. And as it invariably happened that when any one of them got the better of another, the third would ' chip in ' and reverse the situation, the balance of power was in a chronic condition of wobble ; which state of things was good for all parties, keeping the people occupied and saving their three rulers from *ennui*, a complaint which frequently proved fatal in those pre-dynamite-and-new-woman days.

" Such was the condition of affairs when Wang Sun-ki passed his final examination in archery and shouting, and become a corporal in the bodyguard of his Majesty Chang Wu. From the very first —so say the commentators, his great mind grasped the idea of a radical reform in the art of war. He saw clearly in the strategy and tactics of the day many glaring defects, and to the inauguration of the system which was to make him famous he devoted all his splendid energies.

" His rise was very rapid—partly, as is often the case with great commanders, by what we call luck, partly by help and favor of lovely woman, but chiefly through his own prudence and strength of mind. For, by careful avoidance of all dangerous posts, and by exceeding swiftness of foot, he preserved for his country a life that he knew to be worth more to him than that of any other man ; never, even in the prospect of battle, did this great soldier forget his plans so far as to risk his person.

" His first notable achievement was his marriage with Ling Mei, sister of one of the unclassified or miscellaneous ladies who basked in the sunshine of Chang Wu's court. Through the influence of this model wife, Wang, now a captain of cavalry, became versed in all the details of his sovereign's life, and was soon able to place the usual bribes and *douceurs* with the very best effect. When, after remarkably rapid promotions and unbroken service at headquarters, he became *aide-de-camp* to his majesty and full colonel of the royal catapulters, it is recorded that he divorced the lady Ling Mei, ' for having become garrulous.' and immediately afterwards married one of the numerous princesses royal—a lady with some wealth, a deal of acidity and a squint—which self-denial meets with much praise of the commentators. At this period our gallant colonel began to find again the bread which he had cast upon the waters of his youth ; where heretofore he had bribed others he now found his own palm frequently and pleasantly greased ; so much so, indeed, that he rapidly became a capitalist and landed proprietor.

" It was at this point of his career that there began to flow the tide in his affairs which was to lead him on to fortune and eternal fame. Just as the squint and humors of his princess royal were commencing to tell seriously on his nerves, causing him unpleasant doubts and qualms as regards the " sacking " of Ling Mei, tidings reached the court of the advance of a large army from the Wu frontiers. This in itself was bad enough, but when it became known that the king of Wei had made a formal declaration of neutrality, things began to look serious.

" For it was only three years before that the joint forces of Han and Wei had invaded the Wu territories, exacted heavy penalties, and bound over the turbulent king thereof to keep the peace ; and it had been solemnly agreed in the resultant treaty that the rulers of Han and Wei should be as brothers for ever—both being, at that particular time, weaker than the king of Wu.

" Here, then, was treachery and intrigue, and a prospect of much fighting, and our gallant Wang found himself suddenly ordered from the squint of his unamiable princess to the command of the Han force in the field—found himself, moreover, decorated with a peacock's plume and wearing the pipe and tinder-box of a field-marshal.

" Now, as the reader will have observed, the great genius of Marshal Wang had not, so far, developed itself in the stress and turmoil of battles. Rather had it been shown in a wonderful capacity for circumventing his fellow men in times of profound

peace. His nomination to the leadership of the Han army is, therefore, regarded by the shrewdest of the commentators as the joint work of his Majesty Chang Wu—with a covetous eye on the reversion of Wang's real and personal estate—and of the lady Wang, tired of her lord's marked aversion to squints.

" Behold, therefore, our field-marshal at the head of his army, riding in state on an ambling jennet, his head protected from the sun by the red umbrella of honor. Around him are gathered his lictors and a body-guard of athletes and acrobats. For miles behind, and straggling over the fields on either side, his ' braves ' are making their way, in extremely loose order, towards the Wu frontier. Each man carries his weapon in one hand and an umbrella in the other, for it is the rainy season and showers are frequent. An imposing sight is the departure of this great army ; the citizens stand on the walls and cheer lustily as regiment upon regiment straggles over the ploughed country, looking for all the world like a caucus race.

" Slower and slower ambles the fat jennet as the city walls fade in the distance. The great chief is lost in thought in the first throes of that tremendous conception which is soon to revolutionize war. At the mid-day hour, on the edge of a pine forest, he commands a halt, and here, while dinner is being prepared, he orders that the army be drawn up in hollow square, from the centre of which he will address it. Such is the intimation conveyed by the herald and gong-beaters ; and soon the smoke of five thousand rice pots is curling upwards on the soft spring air.

"And now the immortal Wang, with his jade spectacles on his nose and the peacock's plume proudly waving, is mounted on the roof of a sedan chair. Behind him the trumpets sound a war note, and immediately the whole camp is hushed. So still is all that vast host you could hear a baby cry.

" ' Men of Han,' said the great commander, ' the campaign on which we are now setting out is no ordinary one ; it is for you and me to make it ever memorable ! It is, I believe, our common object to keep the enemy's forces from invading our territories, from marrying our wives and enslaving our children ; and a secondary aim is ours in the desire to come out of this war with our persons undamaged and our pockets heavy. (Applause.) But, as I look upon your honest faces, I am thoroughly convinced that the army with which I am told to 'do or die' is totally unable to face the Wu forces with any sort of credit. Your numbers are insufficient, your weapons beneath contempt and your commissariat does not exist. (Groans.) All these faults, my friends, are due to the administration of military affairs by civilians.' (A voice from the ranks : ' Let us go back.')

" ' No, friends, we will not go back, for that way lies dishonor ; before us are wealth and honor and a ripe old age.' Here the field-marshal resorted to his silver snuff-bottle, and all the army breathed deep in expectation.

" ' As I have said,' he continued, ' your appearance is such as to convince me of your utter inability to fight, and my experience teaches me that you would never wait to do so. That discretion for which my troops have ever been famous would lead you to outmanœuvre the foe by strategic and rapid movements to the rear. You would return to your own homes, and I would be left to do the same, with the inevitable prospect of explaining affairs to an irate sovereign, which would be very unpleasant for all of us. Therefore, oh ! men of Han, thank Heaven that it has sent you a chief capable of leading you to certain and painless victory. Eat your fill of rice to-day, and to-morrow go forward, leaving the issues of this war with me alone. They have told us to do or die. I think I am right in saying that we unanimously choose the former alternative. Let us therefore resolve to 'do'—(A voice : " What ? ") —to 'do' that civil administration which is the cause of all a soldier's trials and dangers ! ' (Great applause, then silence.)

" ' I see, friends, that you do not grasp my meaning. I am glad of it. All I now ask of you is that no man of you shall start for home during the next forty-eight hours. I myself guarantee your personal safety—on my red button be it !—but any premature desertion will upset all my plans. Let us but come in sight of the enemy and you may leave the rest to me. And, friends, meanwhile let our watchword be 'do—not die !'

"After which oration the field-marshal remounted his ambling steed, camp was struck (it was the only thing struck during the campaign), and the army straggled cheerfully towards the frontier. Such was the combined effect of the speech and a plentiful meal that several regiments sang as they marched.

" The commentators rival each other in eulogising Wang's grasp of the situation and of his appreciation of the materials at his command. It was the practice in those days for the weaker army to march to within shouting distance of the enemy, at which point every man would discharge his weapon, throw it away, and flee for home as best he could. How different to such conventional and dangerous tactics were the methods of the immortal Wang ! Has not his famous watchword, ' do—not die,' become proverbial throughout all Cathay ? Is it not always in use by the makers of rhymed couplets ?

" The army had advanced two days' march—about six miles—since the making of the great speech ; its soothing effect had thus partly worn off when the elephants at the head of the Wu vanguard appeared in a valley beneath it. The Hans gazed in silence as the enemy's forces wound their way like a gigantic snake round the base of the opposite hills ; and the habits of their old military training came strongly upon them. ' If we shout from here,' said a bronzed veteran, ' surely they can hear us. And what place could be better for discharging our weapons ? ' The impulse spread like wild fire, and scarce a man in all that vast host but thought with joy of seeing his home again before the rising of another sun.

" They had forgotten their chief. Thoughtfully gazing on the enemy below, that great man sat erect in his saddle, heedless of all around. Silent he sat ' as on a peak in Darien,' until his well-trained eye detected the commander of the Wu forces in his usual place at the extreme rear. Then, turning in his stirrups, he spoke to his body-guard, or rather to that place where, had discipline prevailed, the body-guard should have been.

" ' Summon me a herald,' he cried, ' and call hither my treasurer and the chief scribe, for with these I will go down into the valley. You, my brave fellows, will wait here. Should the enemy cross yonder stream, you are at liberty to follow your own instincts and knowledge of the country ; but if not, I shall expect every man to be here when I return—it will go ill with you, my friends, if my expectations are not fulfilled.'

"A shout of approval went up, for the terms were easy. This was an entirely new departure in warfare. Few expected to see their general again this side the grave, and still fewer believed him able to persuade the enemy to remain on the further side of the stream. Therefore the army gathered itself joyfully about the rice cauldrons and prepared to enjoy a day of rest, husbanding their energies for a night of flight. A trumpeter only remained on the hilltop to watch the enemy and give a signal when the river should be crossed.

" Field-Marshal Wang, with herald, scribe, and treasurer, all clean shaven and in full uniform, rode therefore to meet the Wu army—a proceeding totally without precedent, and not to be found in the treatises on war. They carried no weapons, nor (with the exception of Wang's insignia) valuables of any kind all these had been left with the field chest in charge of the field-marshal's own relatives and retainers, with orders to make straight for the house of Wang in case of an advance of the enemy.

" The field-marshal rode light and without misgivings. If he died, he had effected an insurance--so to speak—on his life ; if he lived, fame and fatness were his assuredly.

" In this wise they came therefore within three bow-shots of the Wu vanguard, which, seeing what it mistook for an approach of cavalry, promptly fell back on the main body. Some confusion resulted which might easily have ended in a panic, had not Wang, with keen military insight, understood the position. Immediately he dispatched the herald to proclaim that the field-marshal of the Hans, unarmed and unsupported, desired an interview with the Wu commander-in-chief. No sooner was this message understood than the army rallied, and the four envoys found themselves prisoners. Their persons were searched and treated with some want of courtesy, their lack of valuables being unfavorably criticised. All this Wang had expected ; with composure he witnessed the removal of his peacock's feather, tinder-box and ambling jennet. All he asked was an interview with the commander-in-chief, and he awaited with admirable composure the arrival of that dignitary.

" The details of that interview have never been made public, but its results were the fulfilling of all Wang's hopes and the dawn of China's modern system of warfare. Before nightfall the Wu forces were in full retreat towards their frontier, carrying with them not only the war chest (two million taels of silver), but many weapons, flags and uniforms belonging to the army of his Majesty Chang

Wu ; also that same evening Field-Marshal Wang, having recovered his personal property, encamped his forces in that pleasant valley, and dispatched messengers in haste to the capital with news of a great victory.

"His despatches, still preserved in the national archives, are masterpieces of their kind, and have since been the type for all such documents, even unto the present day. Seated luxuriously on a soft-cushioned divan, our hero wrote in flowery, classic style of stricken fields and horried deeds of blood ; with the peaceful voices of his happy ' braves ' in his ears he recorded their terrible slaughter and the first hard won fight. And while graphically describing to his king the scene and details of his victory, he sent in token thereof five banners, two hundred arbalists, and an elephant, abandoned (for value received) by the Wu army in its retreat.

"The first despatch ends as follows :—

" 'The enemy, your majesty, is now in full retreat for the hilly country towards Wingtaishan, and thither we shall pursue and harass him forthwith. One or two more victories and the king of Wu is a suppliant at your majesty's feet. Before anything further can be done, however, our funds must be replenished. The expenses in this campaign are peculiarly heavy. Your army, more numerous than ever before in the field, needs a generous commissariat, and the country is extremely poor. It will be necessary to buy horses and equip a force of cavalry, etc. Therefore your servant prays that a sum of at least five million taels be sent under reliable escort to the front with as little delay as possible.'

"Here follows a list of the killed and wounded, together with recommendations for honors and promotion, in which latter the herald, scribe, and treasurer are honorably prominent.

"That same night, having sent off his despatches, Field-Marshal Wang dined with Hung, commander-in-chief of the Wu army, at a little inn some three miles from the scene of their first meeting. Here, under a trellised vine, the generals discussed their evening meal and the coming campaign. ' Fair play and a clean divide,' were Hung's terms ; ' turn and turn about for victory ; a long war, and profits shared.' Which was precisely the way in which Wang had already solved the matter.

"Over a second bottle of *samshu* they arranged the details ; the management of the troops, who were to be well paid, refused furlough, and encouraged to marry and settle down ; the treatment of messengers, heralds, and war correspondents, who must either be bought or sold ; the necessity for removing the seat of war to a point far away from both capitals—these and other minor matters were soon amicably arranged. And as the two generals bade each other good-night over a last cup, it is recorded that Hung fell on his knees before the illustrious Wang and *kotowed*. 'That makes eight millions to begin with,' he said, ' and this is our first. You are the greatest soldier that ever lived ! '

"We need not follow the progress of that campaign. Removed to the borders of the Wei territory, the fortune of war ebbed and flowed for three years, both sides claiming frequent (and expensive) victories. At the end of that time the civilian population of both countries was practically (an inkling of the art of war having leaked out) deserting trade for a military career by thousands. At this period, moreover, the troops of Wei, having gradually perceived the immense advantages of Wang's tactics, took the field of their own accord against the combined forces of Han and Wu. These latter, having after successive victories remitted all their arms, elephants, and *impedimenta* to each other's emperors, were not in a fit state to resist an attack ; besides which, the greater part of both armies had accumulated money, settled down, and begun to provide themselves with heirs. There was nothing for it, therefore, but to accede to the terms imposed by the Wei leaders, especially as these were not difficult. The Wei general reported a victory over the allied forces of Han and Wu, asked for funds to continue the campaign, and joined the enemy. The operation, in fact, was equivalent to what in these days we call ' watering the stock ' and increasing the number of shareholders.

"Such was the nine years' war, the first and only campaign in which our great field-marshal ever took part. It ended in the declaration of a general peace—which proved to be the beginning of hostilities—a declaration brought about not because the armies wanted it, but because the rest of the population did. From that day to this the system and tactics of the immortal Wang have been closely followed by every Chinese general with few variations.

"And, as one of the commentators aptly asks : ' What method could possibly be better ? By this system you see large numbers of violent men constrained to peaceful days and provided with a livelihood. Difficult questions are thus settled, not by bloodshed and tears, but by lapse of days and friendly agreement. Finally, the kingly greed of glory is harmlessly satisfied, while the people are kept in a state of healthy excitement. Rightly did the illustrious Wang gain a place in our *Pantheon !* '

* * *

"In the war which China waged against Japan, it was with the greatest pain and surprise that her generals found their system of classical warfare unknown to the Japanese—or, at all events, unpractised by them. So keenly did they feel on this subject, and so unwilling were they to depart from established custom, that the whole Chinese army—generals, corporals and privates—preferred rather to give up their profession than continue a war on the lines adopted by the enemy. ' There is no money in it,' they said, ' and very considerable personal risk.'

"The reader has, therefore, only to remember this fact to understand the Japanese victory at Pingyang. On the glorious day, out of 20,000 Chinese in action, 16,000 were made prisoners and 3,984 escaped to the hills, the fate of the remaining sixteen being uncertain. If they were killed it was certainly through no fault of theirs, but through ignorance of the range of modern musketry."

* * *

The Origins of the War

A Frivolous Report for Serious Minds

By Peggy Hull

Formerly War Correspondent with the American Expeditionary Forces in Siberia, France and the Mexican Border

DURING the world war one of the most popular songs among the soldiers ran something like this—

" Good-bye Maw, good-bye Paw,
Good-bye Mule with the old hee haw,
I don't know what this war's about,
But I bet by gosh I soon find out."

That is what I thought I would do when hostilities in the vicinity of Shanghai took our minds away from the usual diversions of the day. Ordinarily it is a simple matter to find out who started a fight and why—but when I confided my intentions to a friend, he skeptically remarked, " This is China."

From a list of people who enjoy reputations as experts on China, I selected a few names and started out on a reason-destroying task.

" This, of course " remarked Eminent Expert No. 1, " is a complicated case which will not be easily understood by the average lay mind, and will therefore be more difficult for the feminine brain to assimilate."

I marshaled all my wits after this remark and leaned forward in my chair, prepared to listen intently.

" In order," he went on " to appreciate the bitterness of this conflict we must go back to the time of Confucius, 2,500 years ago "—this seemed a long time to go back for a little war that had just started a few days before, but I recalled he was an expert and probably my feminine brain was not assimilating properly.

" It was then " he explained with a dramatic sweeping gesture toward the 2,500 years ago, " that the seeds of internal strife were sown between Chekiang and Kiangsu, and the battle now being fought beyond the settlement boundaries is nothing more or less than the fruits of that sowing centuries ago." What old seeds they must have been !

" The rivalry which existed in those days " continued the expert on Chinese politics," has been handed down from father to son, a heritage of hate, and until this enmity can be stamped out, until education along the principles upheld by the western peoples, the principles of love, peace and unselfishness can be taught the natives, this wretched country will be forever involved in warfare."

He concluded his statement with an emphatic bang on the teakwood table. " There " he said, " you have the cause — and if it is a bit difficult to understand, do not feel too much concern about it, there are thousands of others who will not be able to, either."

I thanked him and ventured one more query. " What will result from this conflict ? "

" Oh that is very simple—" he replied hastily, " yes, yes, very simple. This sort of political unrest and bickering is bad for our trade, upsetting to our nerves, and of great inconvenience to our families who are absolutely cut off from their usual evening motor rides around the Rubicon. Consequently there can be but one possible result. The United States will have to take Chekiang and England Kiangsu, put in their own governors and run the provinces until such time as the natives have learned self-control and done away with this spirit of conquest and aggresiveness. Yes, the results will be quite simple." He smiled benignly at me and turned his scholarly attention to a paper-littered desk.

On my list was the name of a business man, young, ambitious, and well known as a clear thinker. He had not lived so long in Shanghai as the Eminent Expert No. 1 but he was the sort who keeps up with the affairs of any country in which he happens to be.

As I entered his office he carefully flicked a bit of waste paper from the shining glass top of the mahogany barrier between us and smiled a welcome. I knew right away that here would be no suggestions about the lack of thinking material in the female head. He had been sued for breach of promise once—and lost the case.

" To me " he began seriously," this is a fascinating political problem. Never, even in the hottest campaigns in the United States have I been so interested in a situation as in this. I can't help but admire Lu and Chi for putting their armies into the field to settle an argument between themselves. It smacks of primitive days and makes one forget the humdrum life of how many tins to get off on the next boat. Of course I have my own opinion about how the argument really started and I am sure if anyone else in Shanghai had followed the news of the past six months as closely as I have that he would agree with me." He hesitated, drew deeply on hid cigarette and leaned back in his swivel chair, looking at me through narrowed eye-lids. There was an air of shrewdness and supreme self-confidence about him. At just the proper moment he suddenly shot a question at me—" Do you know that the union of Soviet socialist republics is back of this ? "

I was taken completely by surprise and had to admit that I didn't know it—hadn't even thought of such a possibility. This annoyed him but he went on. " They have engineered the whole affair just to get us entangled so that we will either have to fight or get out of the country. Of course they know the American government is not the kind to go to war over a few citizens and their property so they are banking on making the Chinese think we are trying to grab the country by mobilizing all our warships here—who will then invite us to take them and go home.

" The U. S. S. R. desired this above all things as they will appropriate all the foreign property here and carry on where we left on. Oh the pity of it " and he almost moaned " there isn't a man in Shanghai to-day who wouldn't rather be somehwere else and yet we have stayed here year in and year out, depriving ourselves of the pleasure of living in our own country—boy bring me a whiskey soda " he called out suddenly as though the mention of his country had brought a tantalizing memory. " Need a bracer " he explained " when I think of all that is before me."

" Then you believe it is serious and will not end with the civil war between Lu and Chi and Chang and Wu," I asked, thinking of the seeds sown 2,500 years ago.

" Of course not. This is the most far reaching piece of diplomatic roguery we will ever witness in our time. There is only one thing to do, prepare to face it " and he finished off his glass.

So that was it. Confucius and the seeds and the heritage of hate had nothing to do with it. But upon second thought I decided I had better have one of the above explanations verified by another expert and upon consulting wy list was horrified to find that I had overlooked the most eminent of all the eminent men who are experts on the internal troubles of China.

He laughed sarcastically when I laid the statements of the other experts before him.

" How assinine " he exclaimed. Is it any wonder that we have wars when such misinformed and incompetent people are permitted to air their opinions on these subjects that need years of study and research. Subjects so delicate, intricate and complex that only the most highly developed brain is capable of comprehending them.

" It is not " he assured me, " my custom to give opinions to the public on the various crises as they arise. I have found in the past that it does not pay. Small editors and would-be political experts criticise my efforts and cause me no little annoyance. Consequently my information is kept for certain circles. But under the present circumstances I am glad to give you a correct account of what has led up to this sudden war.

" It has long been known in secret places that the Indians have had their eyes on the conquest of China. If not, I ask you, why are there so many Sikhs in the settlement ? Does not their presence indicate that their countrymen are planning and working to get this beautiful land in their grasp and annex it to the Indian empire which they hope to shake free from England's hold ? Isn't it true that these very same Sikhs speak the dialects of China fluently and show through their arrogant and brutal treatment of the richsha coolies that they are but the vanguard of an invading race ? I assure you that it is not the wish of these gallant men who are fighting now, to fight. Any sincere student of China and Chinese history knows that the Chinese are thoroughly honest, generous, peaceful and love each other dearly. It is their desire to live quiet, industrious, religious lives but the pernicious influence of this power which is seeking a foothold here, keeps through the persuasiveness of gold, the country in a state of warfare.

" The puerile reason offered by so many that Lu and Chi are fighting over the geographical position of Shanghai is ridiculous. Why should they care which province it is in ? They love each other like twin brothers. They have been devoted for years, dividing their honors and incomes. And Chang Tso-lin and Wu Pei-fu—it makes me laugh " and he said " why they have eaten out of the same rice bowl ! No, it is not the Chinese who are fighting this battle but the sinister figure of corruption behind them and I am more than grateful to have this opportunity to tell the world what really causes China's wars." He sank into a chair and breathed heavily at the close of this exhortation. While he was deep in thought I quietly slipped away.

When the chauffeur said " where go ? " I had an inspiration and throwing my list of experts away asked him what had caused the war.

" Oh " he answered quickly " I savvy this war plenty. All Chinese man makee fight wantchee be number one. I think more better fashion before time have number one stop Peking side. Now have got too many number one, all time makee plenty bobbery."

I decided that my quest was ended and stopped for a cup of tea with a Shanghai matron. She was talkative so I ventured once more, " What's it all about ? "

" Well, it was this way," she explained, drawing designs on the tea cloth. " Marshal Chi was down his full stake and Lu was up that amount. Chi had a limit hand and Lu knew it. So he chowed out of turn and mah-jonged when it was Chi's pung and game."

* * *

German Trade with the Orient

C. C. Bachelder, former representative of the department of commerce in the Far East, told the Institute of Politics at Williamstown that students of the Dawes plan had concluded that on the markets of the Orient depended the possibility of Germany selling enough manufactured products to pay the large sums of money due to the allies.

" In all the discussions of the Dawes plans," Mr. Bachelder said, " great stress is laid upon the fact that it will be very difficult for Germany to pay to the allied powers the large sums called for by its terms except from the surplus of its exports over its imports. As the purchasing power of Russia, Turkey and other countries will evidently be much less than before the war, it will be difficult for Germany to sell abroad as much as before the war unless its other customers buy more. It hardly seems likely that the purchases of Europe and North and South America will be increased enough to make up for the deficiency, and the only opportunity for a very great expansion of its sales of manufactured products seems to be in the Orient, which is the home of about half of the human race."

The opinion of this trade expert, however, is not shared by the present chief of the bureau of foreign and domestic commerce who invites attention to the returns which show that although German trade with the Orient had increased in value in 1923 by thirty per cent. over pre-war years there was little increase in quantity. In the opinion of F. R. Eldridge, so far as Far Eastern trade with Germany is concerned, there appears to be little that the Dawes plan can accomplish in the way of restoring to Germany its pre-war Oriental markets. It is a revelation to those not familiar with the rapid return of Germany in the Far East to learn that in Germany's four principal markets—Japan, China, Netherlands East Indies, and India—the amount of imports from Germany during 1923 was 30 per cent. greater than during the pre-war year of 1913. The trade of these countries translated into dollars shows that while they imported but $106,577,000 worth of Germany's products in the pre-war year, their imports last year totaled $142,316,000. Taking into consideration the higher price levels in these countries, which averaged about 60 per cent. in 1923, there is little absolute increase in quantity for imports from Germany, although the value of German imports shows a substantial gain.

The Far Eastern trade with Germany during 1923 is compared with that of the pre-war year 1913 in the following table :—

IMPORTS.

Countries	1913.	1923.
Japan	$32,197,000	$60,121,000
China	20,660;000	25,964,000
Netherlands East Indies ..	11,510,000	*19,361,000
India	42,210,000	36,870,000
Total	$106,577,000	$142,316,000

EXPORTS.

Countries	1913.	1923.
Japan	$6,744,000	$1,696,000
China	12,428,000	19,273,000
Netherlands East Indies ..	5,722,000	*6,956,000
India	87,940,000	71,456,000
Total	$112,834,000	$99,381,000

*For 1922—later figures not available.

The exportation from these same Far Eastern countries to Germany during 1923 was 10 per cent. less than that to Germany in 1913. Again, applying the 60 per cent. average increase in wholesale price indices for the Far Eastern countries, a considerable decrease in the absolute quantity of Far Eastern exports to Germany is evident.

Japan's trade with Germany reveals some remarkable developments. In the single item of woolen or worsted yarns the imports from Germany for the first six months of 1923 were 12 times as large as for the corresponding period in 1913. Machinery and engines also showed a substantial increase over the 1913 figures, being more than double, while aniline dye imports from Germany in 1923 were three times the 1913 value. Japan's exports to Germany showed a decline, and in 1923 were about one-third the 1913 value, although camphor exports showed an actual increase.

Imports into Japan from Germany during 1923 totaled Y. 120,242,000 (Y.1 equals $0.4858 at average exchange for 1923, and $0.4985 at normal exchange), and exports to Germany amounted to Y.3,392,000. Details of the year's trade are not available.

China's trade with Germany does not show the same recovery as that of Japan's. Considering the increased prices in 1923, there is apparently an actual decline in the volume of China's imports from Germany compared with the pre-war year, although the exports to Germany from China show approximately a 120 per cent. increase in value as against a 45 per cent. increase in price level. Imports to the value of 32,456,067 haikwan taels and exports worth 34,092,022 taels constituted China's trade with Germany during 1923. The details of the importation and exportation of the various commodities are not available.

The trade of the Netherlands East Indies with Germany showed a decided recovery during the nine years ended 1922, the latest period for which statistics are available. The increase in value, however, just about equals the increase in the Netherlands East Indies' price level and, therefore, it can be assumed that gains in quantities imported from Germany were small. In such items as machinery, iron and steel, hardware, glassware, and paper manufactures, however, there are substantial increases even in quantity. Exports from the Netherlands East Indies to Germany showed little advance, and in actual quantity registered a decrease.

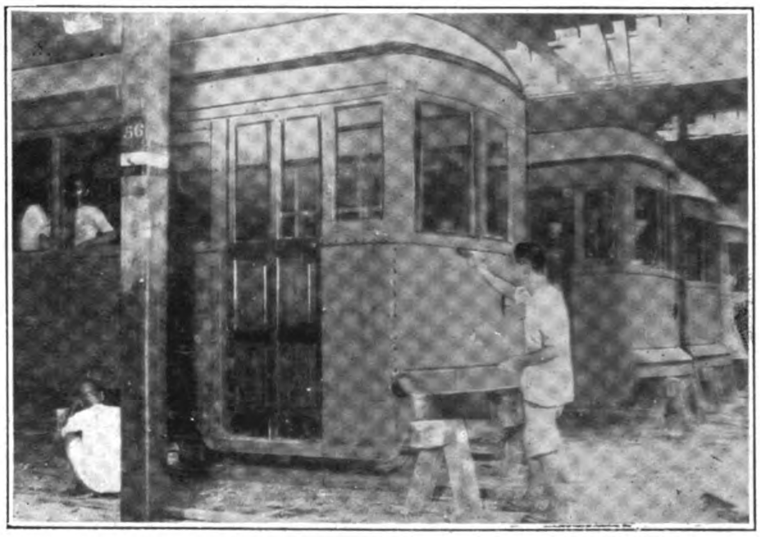
Germany's trade with India has recovered less than that with any other Far Eastern country, and both the import and export trade between the two countries has declined compared with 1913-1914. There are increases, however, in such items as coal-tar dyes, hardware, glassware, and newsprint. The principal decrease in Indian exports to Germany took place in hides and skins and jute, while raw cotton registered an increase over the 1913 figures.

Germany's ability to regain its Far Eastern trade has been due almost entirely to organization. During the war there were many German engineers who remained in the Netherlands East Indies and continued to keep intact the contracts which they had established there. When the war was over these engineers were on hand, and, although operating under great restrictions in British territory throughout the Far East, they were able to extend Germany's trade from nothing at the end of the war to almost its pre-war figure. In China, German engineers have benefited through the Sino-German treaty, which gives up extraterritoriality, but permits Germans to travel at will in the interior. Latest reports indicate that German engineering firms are very active, in the interior, and are establishing many industries on a co-operative plan, the Chinese putting up the working capital and the German firms supplying the machinery. Thus, many cement works, glass factories, egg-drying establishments, and other local industries are being fostered through German enterprise in China. Germany's comeback in Japan has been one of the most remarkable in the whole Far East, and the Japanese dye industry recently had to be protected by the imposition of a licensing system which was aimed particularly at German dye imports.

German exports to the Far East are carried in German ships, and are financed by such strong combinations of capital as the Stinnes group, which has been particularly active in the Orient during the last few years. The results of their activity are indicated in the trade returns.

Japan Using Steel Cars

A predominating tendency in steam and electric railway enterprises in Japan to-day is to operate steel cars, instead of wooden ones. The imperial government railways department, too, has a plan to operate these, and investigations have been made into such items as cost and maintenance. The accompanying picture shows the finishing touches being put on some of the steel tram-cars now under construction at the Tanaka Iron Works, Shinkita-machi, Kita-ku, Osaka. Ordered by the Kobe municipality, they went into service as soon as the paint was dry.



Steel Bogie Car Nearing Completion

Yokohama Specie Bank Opens New Quarters for Shanghai Branch

SHANGHAI'S crown of jewels is her Bund and the latest, if not the brightest ornament therein is the Yokohama Specie Bank building into which more than two score of manufacturers have poured their cornucopias of the best in modern building materials to make this structure unique. It is built for banking and every atom of it has been swerved and trained for that one purpose, the ready and immediate accommodation of its patrons. The exterior of a building is indicative of its stability, and the interior of its usefulness for while the Yokohama Specie Bank in its outward aspect bears testimony to the genius of Mr. Frank Collard of Messrs. Palmer and Turner, architects, so does the interior also in that it is just as admirably fitted to the business of banking as its exterior is a delight to the eye. Mr. Collard has succeeded in adapting many Japanese features to his general Neo-Grecian exterior design and the result betrays none of those messy lines that commonly crop up in buildings where an attempt is made to graft West upon East or *vice versâ*.

The exterior of the bank, of Japanese granite, many stones of which went through the earthquake and fire of last September, forms a fine contrast with the black iron gates set in bronze and bearing bronze castings that depict the mask and arms of the ancient Japanese warrior, fitting guardians for a financial institution. These are not grotesque but have rather a Viking cast of countenance, and the castings bear evidence that British bronze founders have lost none of their ability in carrying out the artist's design no matter how exotic. The plain granite facing is continued throughout the interior of the spacious portico which serves as the base of the classic Ionic fluted columns which run up the front to the main entablature of the building. Lining with the centres of the columns are ornate bronze lamp standards, the lamp itself being supported by groups of finely moulded figures that resemble both the ancient Egyptian and the modern Formosan aboriginal costume, and the effect of these Oriental touches in the bronze-work is heightened by the keystones of the window arches. These are sculptured granite heads about six feet high with downcast eyes that seem to echo the placidity of the Buddha of old but which mayhap express only the calm resignation of the modern banker. These, as well as the bronze gates and lantern holders are of Mr. Collard's design and testify to the painstaking care with which he has rounded out the general idea of his design, mingling East and West in harmonious unity.

New Yokohama Specie Bank Building which is Classed by Architects as One of Most Beautiful Structures on the Shanghai Buud

The following from the pen of Mr. John Lofting, architect and quantity surveyor, is an appreciation of the *ensemble* of the building:—

"The plain granite facing of this part is continued within around the spacious portico and the solid simplicity of it, whether the gates are shut or slid out of sight within the massive walls and piers, forms an efficient and impressive base to the pair of five-feet-diameter plain circular swelled columns which run right up the front to the main entablature. A sculptured Japanese mask with helmet is very happily introduced into the bold Ionic capital of each column.

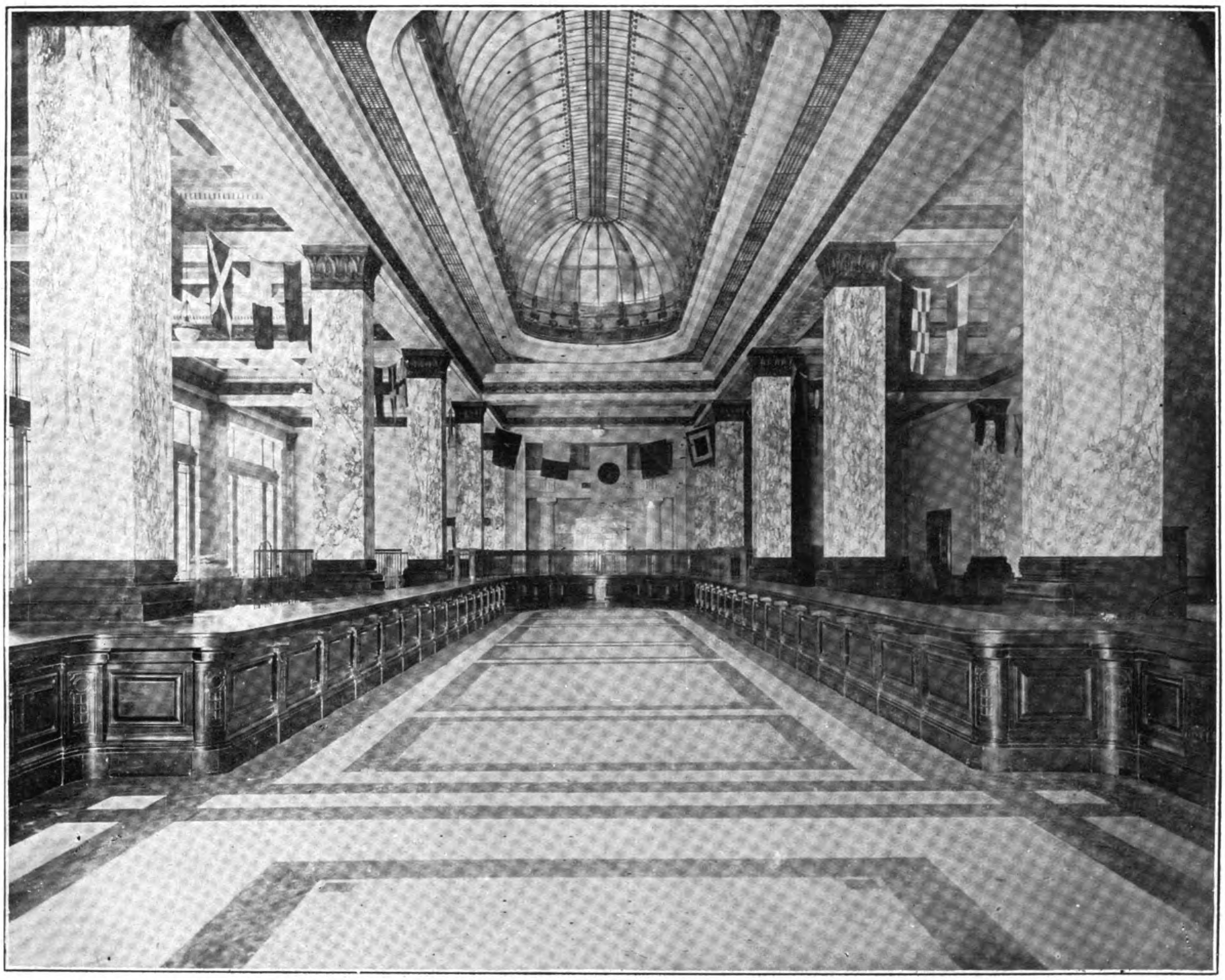
"The colonnaded front is flanked each side with a pair of wide plain pilasters in low relief culminating in delightful fluted capitals. The severity of these plain columnar flanks is finely relieved by the flat oriel window set between the pilasters in each case, supported by the sculptured head (of antique Japanese origin) of the keystone of the arch below, and capped with a rich copper canopy head. The main entablature above the capitals is built up with a plain architrave and freize and a wide overhanging cornice.

"The wide-fenestrated perfectly plain storey above the cornice terminated on the sky-line in a boldly designed bronze cresting of a shell motive which gathers upwards in the middle of the flag pole base with a daringly original but charmingly successful design comprising the Japanese sun-burst flanked each side by a large Phœnix, all flashing golden down the river.

"This new bank front on the Shanghai Bund is arresting not only for its bold originality but also for its impressive dignity. Such a happy combination in modern architecture is a very remarkable achievement."

Entering the building between the marble columns that flank the doorways, one's attention is immediately arrested by the spaciousness of the great banking hall. It is impressive not only in size but in the absence of much of the grill work and ornamental brass that disfigures many modern financial institutions. In the Yokohama Specie Bank most of the business is done over the broad polished hardwood counters and only at the cashier's end is grill work used at all. The sweep of the counters is admirably set off by the great square columns of variegated marble that support the open beamed ceiling. These marble columns were brought out from England and their white and grey veining and mottleing while relieving the severity of the interior design, are at the same time restful to the eye. Each is capped with black bronze in fine contrast with the white beams of the ceiling.

British manufactures enter largely into the construction of the bank which was erected by the firm of Messrs. Trollope and Colls (Far East), Ltd. The steel work was furnished by Messrs. Dorman, Long & Co., Ltd., and the steel casements by Henry Hope & Sons through Messrs. Duncan & Company, their Shanghai agents. The steel reinforcing rods are the product of Messrs. Monks, Hall & Co., Ltd., and the window glass came from the works of Messrs. Pilkington Bros., Ltd., through Messrs. Scott, Harding & Co., Shanghai. To the uninitiated, the amount of piping and electrical conduit work about a building such as this is appalling and it has taken no less than ten firms to equip this bank. The sanitary fittings are from Messrs. Shanks & Co., agent Mr. A. Malcolm. The cast iron rainwater piping with shoes and bends was supplied by the Self Engineering Company, while the



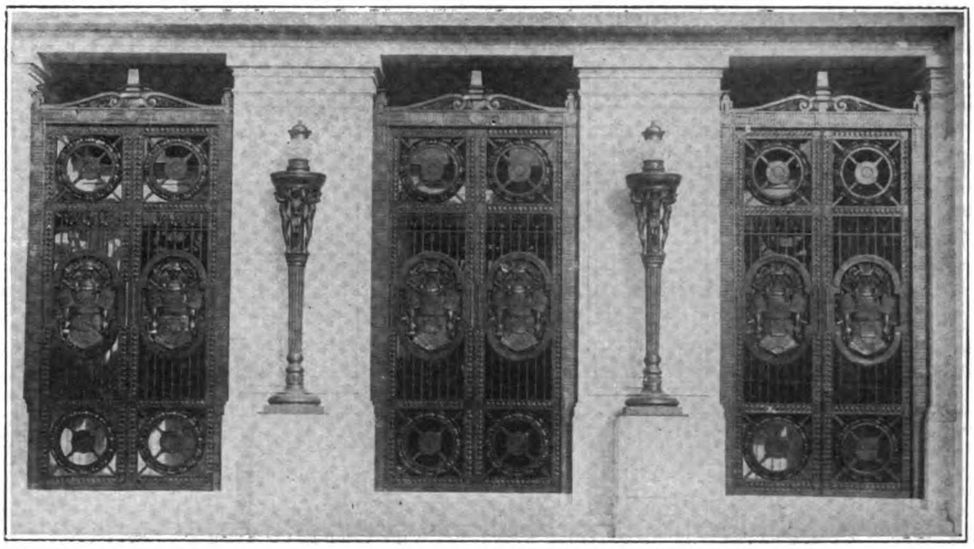
Main Banking Hall of Yokohama Specie Bank to which more than a score of manufacturers contributed in furnishing and equipping it along the most advanced artistic lines as applied to modern business purposes

This marble work was executed to the architect's design by Mr. H. T. Jenkins who has added considerably to his laurels achieved in many noteworthy British and colonial buildings. The terrazzo flooring is the work of a Shanghai firm, Messrs. Tankai & Company.

Another remarkable feature of the main banking hall is the lighting, the building not only being flooded with light from ample windows, but also is illuminated from above by a beautiful lantern light that covers practically the whole centre of the hall and sheds ample daylight into every corner of the great room. This lantern light was supplied by the British Luxfer Prism Syndicate, Ltd., whose Shanghai agent is Mr. A. Malcolm. The lights are from the British Thomson-Houston Co., supplied through Messrs. Innis and Riddle.

coated soil pipe was manufactured by Shaw (Glasgow), Ltd. The Farringdon Works furnished brass sleeves and Messrs. Nicholls & Clark the solder and lead to tighten the joints. Burn Bros. (London), Ltd., supplied soil drain pipe and the Lion Foundry Co., Ltd., the cast iron rainwater piping with its shoes.

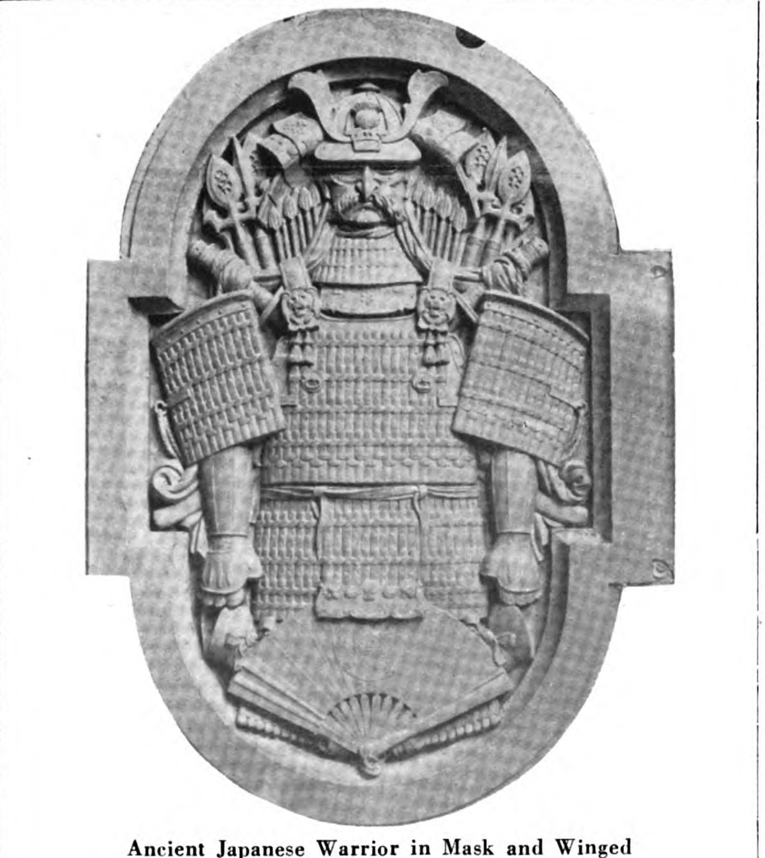
This new building is second to none in Shanghai as regards sanitary fittings which were made by Messrs. Dent & Hellyer, Ltd., the porcelain tubs being supplied by Messrs. Robert Roxborough (China), Ltd., agents for Twyfords, Ltd., and other fittings by Mr. A. Malcolm, the product of Messrs. Shanks & Co. The door furniture and various ironmongery was supplied by James Gibbons through Messrs. Arnhold & Co., while window glass was brought in by Messrs. Scott, Harding & Co., from Messrs.



Magnificent Entrance with Bronze Gateways Cast by Crittall-Freeman Bronze, Ltd., London

Pilkington Bors., Ltd. The heating and ventilating system was planned to temper as much as possible the humid summers and even more humid winters of Shanghai. It was furnished by Wheeler & Comyn Ching (Asia), Ltd., whose local representative is Mr. P. J. Miller who not only took full charge of the installation, but has made several "stand-by" tests to insure its perfect performance. Attention to every detail has been given by Messrs. Palmer & Turner, architects of the new Yokohama Specie Bank building, and every item has been selected with especial care even to the tubular flag-pole which adorns the top of the structure which is from Messrs. John Spencre, Ltd., the Cuburn track and fittings, from Messrs. Carter & Aynsley, Ltd., and the floor springs by Mr. Robert Adams.

One great function of any bank is to keep inviolate the moneys and other valuables committed to its charge, and in respect to its strong rooms and general protective devices, the bank stands second to none. The folding treasury doors are by Messrs. Chubb & Sons Safe & Lock Co., while the Chatwood Safe Co., supplied the strong-room doors. The bookroom doors were supplied through Messrs. Arnhold & Co., Ltd., from John Tann, Ltd., and the fire-protective coverings for the vaults by the Car-borumdum Company. These carborumdum blocks are probably the most fire resistant material in the world and are made in the great electric furnaces at Niagara Falls. In electrical fittings the conduits were supplied by the Electrical Conduits, Ltd. The centrifugal pump for additional fire protection was supplied by Messrs. Jardine, Matheson & Co., agents for Messrs. Merryweather & Sons, Ltd.

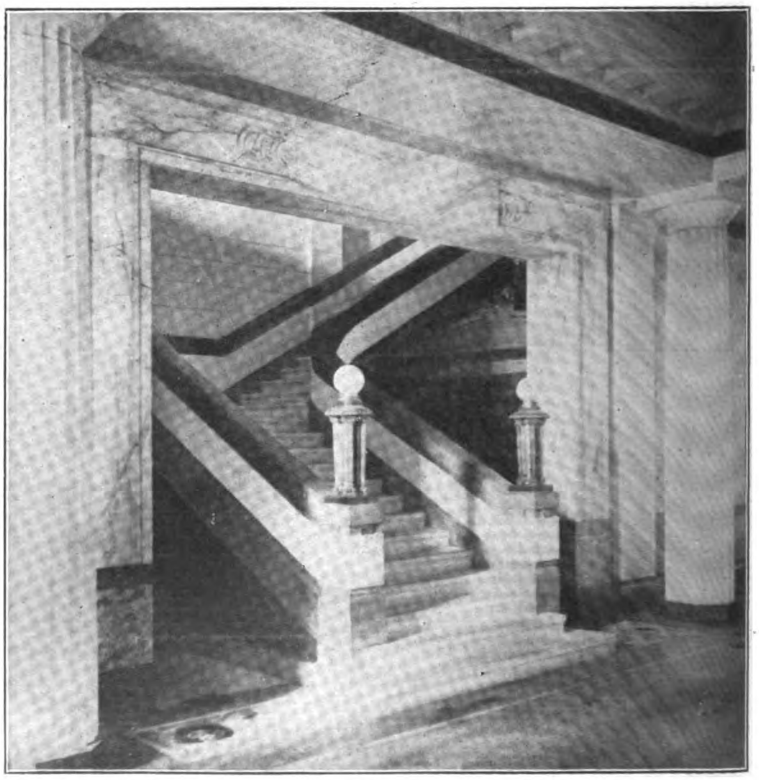


Ancient Japanese Warrior in Mask and Winged Helmet who Guards the Gates of the Yokohama Specie Bank (Shanghai Branch)

Many Shanghai firms took a leading part in the furnishings and fittings of this bank, among them being Messrs. William Jacks & Co., who furnished various items of hardware, R. N. Felgate & Co., who did the painting, while the timber and flooring was made by L. K. Taylor & Co. Some excellent joinery work was done by Arts & Crafts, Ltd., and furniture by Tai Chong. The counters were made by V. K. Shen & Son.

Above the glass dome of the banking hall is a light well extending to the roof of the building and around this are grouped various offices, board rooms, etc. The yare skilfully arranged so that every office is easily accessible and has a maximum of light. Access to the upper stories is by wide staircases handsomely balustraded in marble and by three Otis lifts, spacious ones of the latest American pattern supplied by the American Trading Company. These are of the "micro" drive type in which a clever device is used to prevent an unskilled operator stopping the carriage other than on an exact level with the floor. The same scrupulous attention to details has been shown in these upper floors as in the main banking hall and they are given every modern appliance in sanitation, heating and ventilation.

It was 31 years ago, May 15, 1893, that the Yokohama Specie Bank first opened its doors in Shanghai using temporary premises at No. 11A Nanking Road. Early the next year the bank removed to No. 21 The Bund, premises now occupied by the Netherlands Trading Society. The outbreak of hostilities between China and Japan in September, 1894, necessitated the temporary suspension of the bank's business at Shanghai, and such affairs as were outstanding were left to the care of the Comptoir National d'Escompte de Paris in Shanghai. At the termination of the war, the bank resumed its business here, re-opening its offices in July, 1895.



The Marble Stairway Leading to the Upper Stones of the Bank

Bank Officials present on the opening day (from left to right): Mr. G. Hashidzume, Manager, Shanghai Branch; Mr. M. Odagiri, Director, in charge of China Branches; Mr. N. Igarashi, Director

The business of the bank increased and as greater accommodations were needed, the bank purchased the property No. 31 The Bund, to which its offices were transferred on September 1, 1900. On December 1, 1902, the bank issued its first bank notes, and as the branch went steadily ahead during the years following, in September, 1911, was purchased the property on The Bund, known as the David Sassoon Building, on the site of which the present magnificent new structure stands.

The formal opening of the new building on July 19, was attended by many notables in Shanghai official and business circles. Consular officials and the leading businessmen of the city assembled to toast the long life and prosperity of the institution which now was housed in quarters befitting its importance. Among the officials of the bank who attended the opening of the new building were Mr. Masunosuke Odagiri, director and manager of the China branches of the bank and Mr. N. Igarashi, also a director. Mr. Odagiri renewed his acquaintance with many old Shanghai friends who knew him when he was consul-general in Shanghai before he joined the bank, in 1906. Mr. G. Hashidzume, manager of the Shanghai branch, was warmly congratulated upon his success as a Shanghai financier in that he had brought such prosperity to his branch of the bank.

The keystone of the windows is a placid Buddha-like figure six feet high cut in granite from designs and wax model made by Mr. Frank Collard, of Messrs. Palmer and Turner, Architects of the Bank

The Yokohama Specie Bank has had a long and honorable career, not only in Japan, where the bulk of its business is, but in Shanghai through which passes the major portion of Japan's trade with China. These two countries that are in such proximity are in great measure interdependent and it is safe to say that the large majority of bills of lading and documents in Japan-China trade pass over the counter of the Yokohama Specie Bank. But the Bank has a wider and more important function than the mere discounting of bills. Only Mr. Hashidzume could say how many business endeavors the bank has brought to fruition with profit for all three, buyer, seller and banker. Lacking the active assistance of the bank, the business would have languished or "died a 'bornin'" despite that two of the factors, buyer and seller, were agreed. Probably no factor in Far Eastern diplomatic or business circles has been of more potency in bringing about friendly relations between China and Japan than the Yokohama Specie Bank. It is not easy to cherish a spirit of enmity against the man, institution or country that enables one to make a living and that is exactly what the bank has helped tens of thousands to do. Therefore, despite the diplomats, who sometimes cloud the issue, the Yokohama Specie Bank has been one of the strongest factors in bringing about peace and friendship, through just dealings, between Chin a and apan.

Avery's Wembley Exhibit

Visitors to the British empire exhibition will find much of exceptional interest in the varied selection of weighing, counting and testing machines exhibited by the pioneers of the scale making industry; Messrs. W. and T. Avery, Ltd., whose Stand No. 135 will be found in the palace of engineering.

The stand itself is of unique design, and consists of a weighbridge of remarkable construction, as visitors step on to the stand, their weight is visibly recorded on dials which form part of the office building in the centre of the stand.

Another innovation never attempted before, is the Avery electric weigher. This machine also records at the entrance hall of the palace of engineering the weight of every person stepping on the stand. This machine has been specially designed for commercial use, for checking and controlling weighings which are being made at a distance.

Automatic counter scales will appeal specially to grocers, bakers, confectioners, dairy men and allied trades.

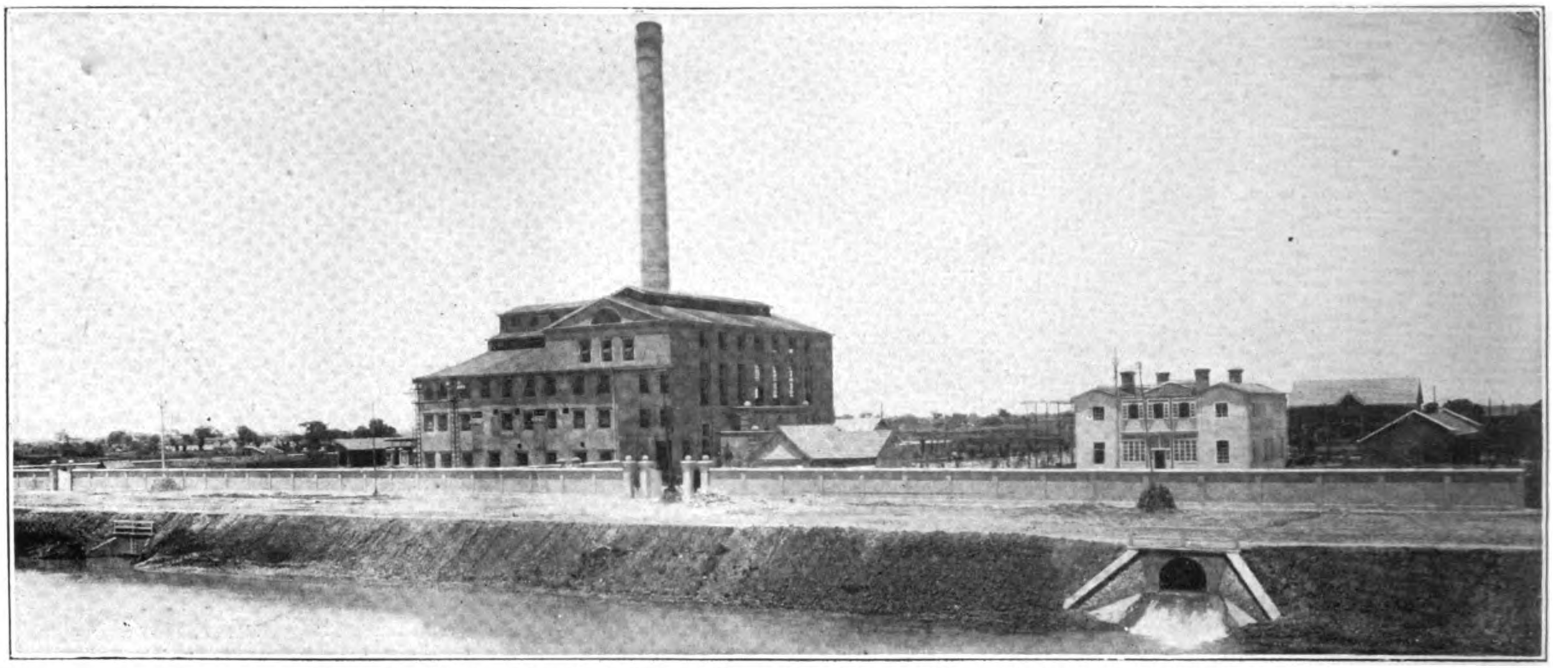
Special models are designed for different markets, and the makers are in an excellent position to advise overseas buyers in the big modern question of automatic weighing.

There will be an interesting selection of all classes of weighing appliances including automatic machines suitable for weighing grain, etc., in docks, silos, mills and granaries; platform machines for plantation and warehouse work, and for bulky packages and travelers' luggage, etc., and weighbridges suitable for weighing railway and motor traffic.

Other exhibits will include counting machines in great variety. These machines count as well as weigh, and are in great demand on account of their accuracy and labor-saving achievements. These mechanical accountants speed up output, and are a great boon in thousands of factories all over the world.

The manufacture of small parts, the man engaged in repetition work, the merchant handling thousands of grosses of little articles, the estimating or costing department anxious to calculate costs quickly from the single specimen and to quote in grosses or thousands—all these have learned to appreciate counting machines. One of the chief causes of delay in the output of a factory dealing with small repetition work, was just the lack of an instrument which would facilitate the accurate counting and distribution of these articles manufactured in thousands and at a high speed in the machine rooms, and this great efficiency Messrs. Avery supply, thus, as it were, oiling the wheels of industry, saving time, and economising in labor.

There will also be testing machines to test specimens representative of a bulk of material, also machines for carrying out tests for hardness. Testing machines for making tests in all directions are now a feature of this firm's manufacture.



Tseng Hua Electric Manufacturing and Power Co.—View of Power Station from South Side

China's First Long-Distance Power Line

Wusih-Changchow 33,000 Volt Transmission System Constructed by Siemens China Co. for Tseng Hua Electric Manufacturing and Power Co.

By R. Kleemann of the Siemens China Co.

THE Tseng Hua Electric Manufacturing & Power Co. was started by a group of Chinese industrialists with a view to manufacturing electrical machinery and apparatus in China. The attempts hitherto made in this direction in the different parts of the country have not resulted in establishing a manufacturing industry of any importance and the promoters of the Tseng Hua Co. were well aware of the difficulties arising for a factory from the peculiar conditions of the electric machinery business in this country, the lack of raw materials, the need of creating a working staff and many other questions that have to be considered in starting a new enterprise of this kind. For facilitating designing work, factory management and with a view to friendly co-operation they made an arrangement with the German Siemens concern which is represented in China by its affiliated Siemens China Co.

The management of the Tseng Hua Co. in an endeavor to secure for their shareholders an investment that should bear interest, as soon as possible, decided to establish a power station before the manufacturing was begun as a power station supplying electricity to the public would be a revenue-producing plant from the beginning, whereas a manufacturing plant would require some years before returns could be expected. Therefor the company applied for and obtained a concession for a power station for the supply of electricity in the Wusih-Changchow district and built the power station which has now been operating since the beginning of the year.

Main Substation at Changchow

The following is a detailed description of the various sections of the plant :—

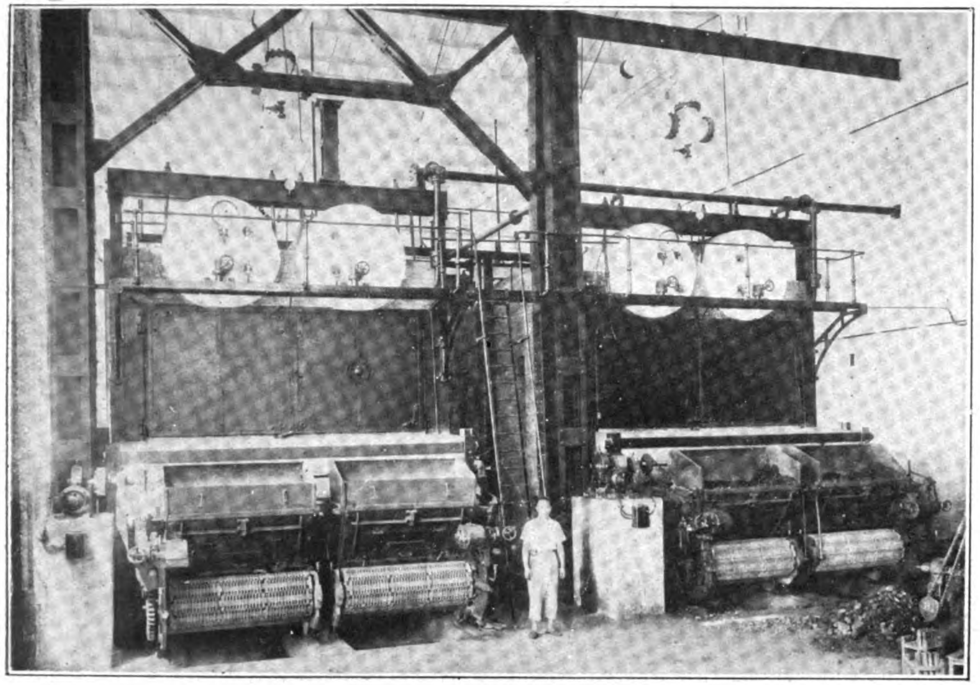
The Power Station at Tsishuyen

THE SITE AND LAY OUT OF THE BUILDING.—The choice for the power station site fell upon a place between Changchow and the village Tsishuyen. This had the advantage of railway connection as it is between Tsishuyen and the power plant. Sampans for coaling also can be berthed in the immediate vicinity. The substrata of compact clay gave little trouble. The buildings were designed by the Siemens China-Construction department and built by the Fushing Engineering & Construction Co., Peking and Shanghai.

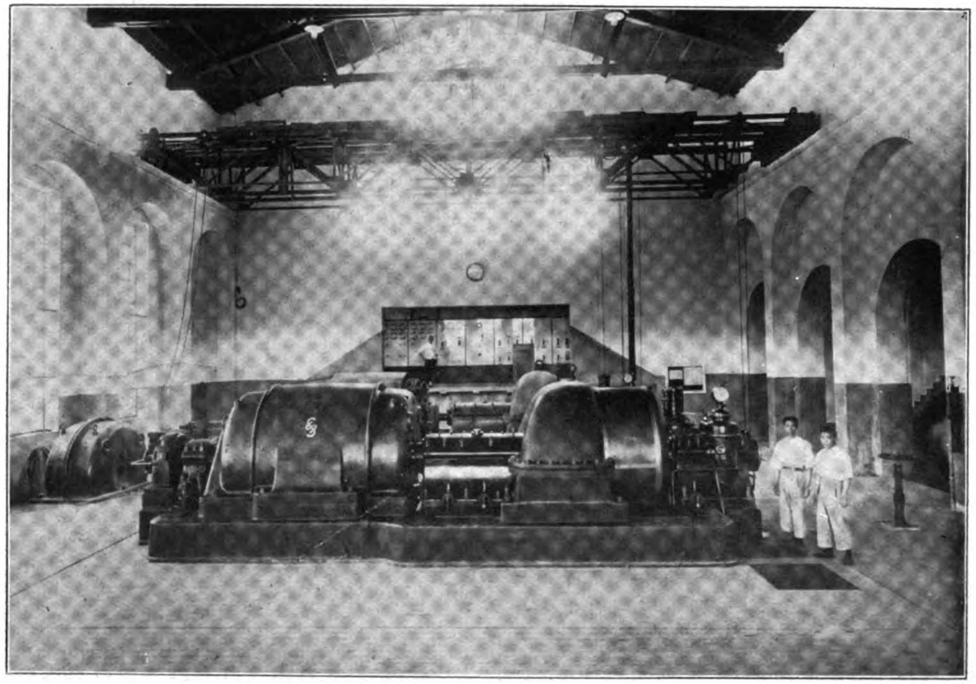
The main building, comprises the boiler-house, auxiliary engine-room, turbine, switchgear and transformer-rooms. The plan and section of the building illustrate the general arrangement of the various rooms. The boiler-house consists at present of two bays each with two rows of boilers. The length of the boiler-house is 14.5 metres, the total breadth 34 metres, the height under the roof is 21 metres. The chimney, constructed in reinforced concrete, is 64 metres high, with an inner diameter of 3.6 metres. In view of the possibility for the extension at some future date, ample allowance was made for a second chimney and for the accommodation of coal-bunkers and ash-conveyors.

The auxiliary machine-room adjoining the boiler-house has one bay of about 34 by 4

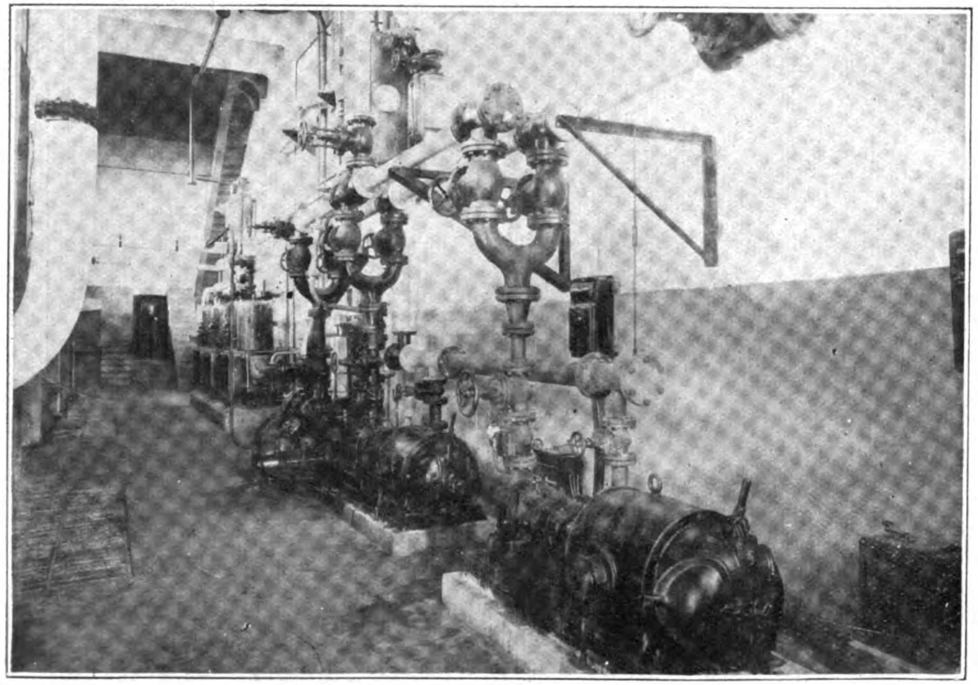
GENERATING APPARATUS OF TSENG HUA ELECTRIC POWER PLANT



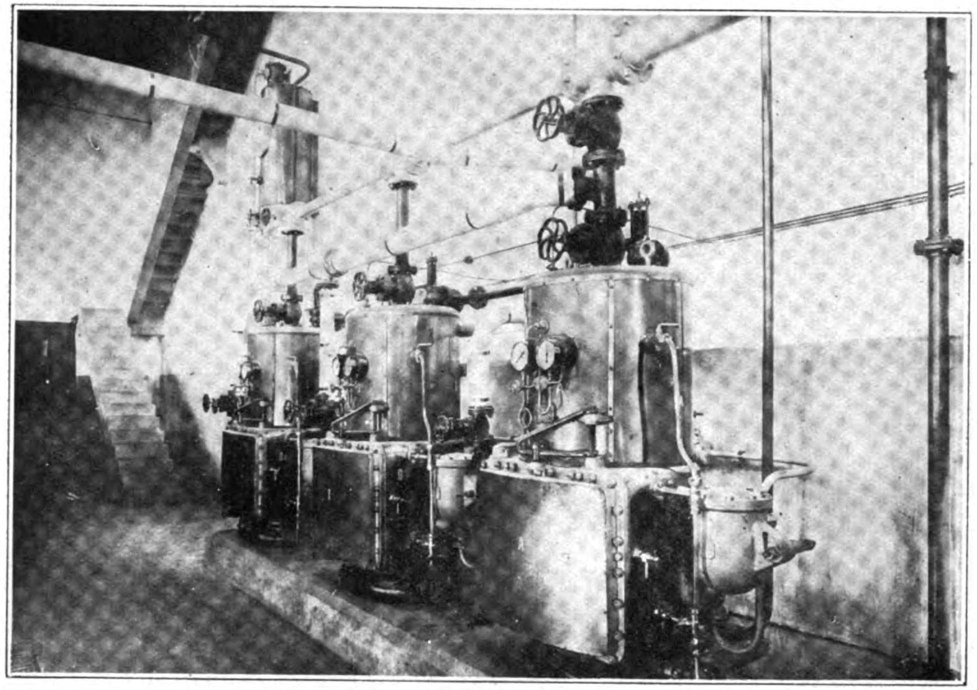
Boiler House with Babcock and Wilcox Boilers, Green Economisers



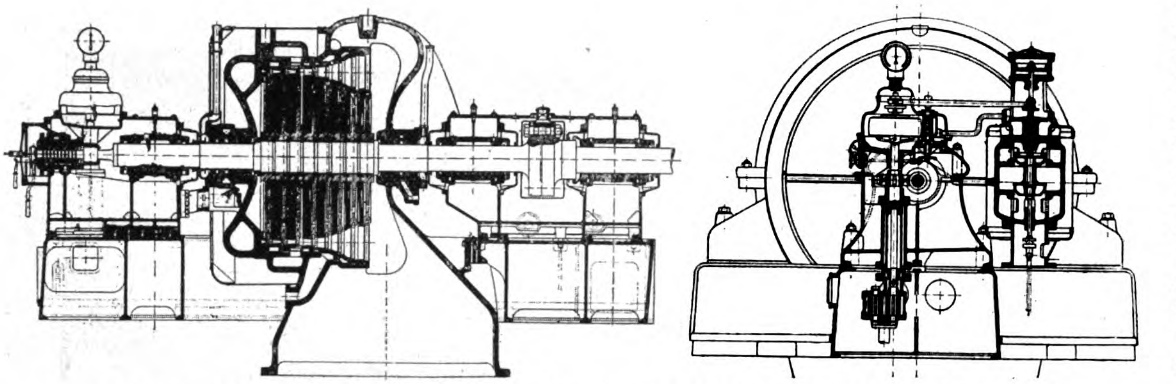
4,560 H.P. Zoelly Steam Turbines Coupled to 3,200 K.W. Siemens-Schuckert Generators



Auxiliary Engine Room Showing Evaporator and Electrically Driven Feed-Water Centrifugal Pumps by Pumpen and Armaturenkonzern (Frankenthal) and Weise Sohne (Halle a.d. Saale)

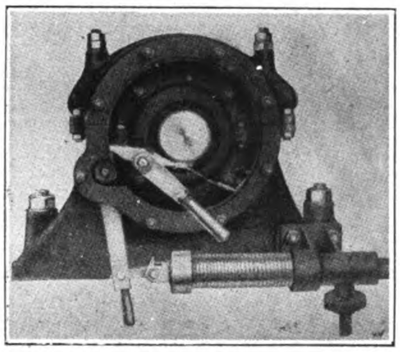


Battery of three Atlas Werke (Bremen) Evaporators Distilling Water for use in Steam Plant, to Supplement Supply from Condensers



Longitudinal Section through Turbine—On Right is shown the Throttle Governing the Turbine

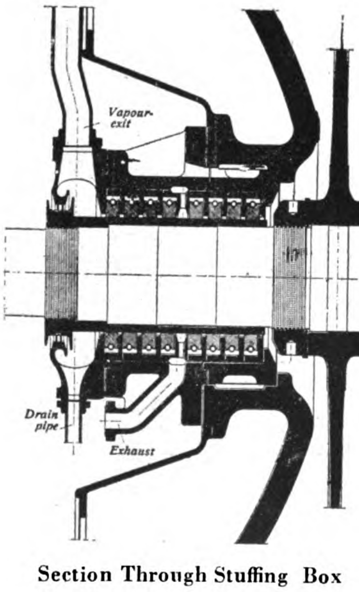
metres area. The structure is heavy as the upper storey has to take the weight of two iron tanks. The supply duct for the cooling water lies under the pumps at a depth of about 7 metres under ground. The first floor, 4 metres above ground level, contains the evaporators and feed pumps; above these at a height of 12 metres are the feed water tanks.



Quick Closing Gear

From the first floor of the auxiliary machine-house a stairway 2.6 metres in height leads to the adjoining engine-room which contains the first power unit, two Zoelly steam turbines of 4,560 h.p. each. The engine-house has an area of 34 by 16.4 metres and a height of 23 metres. Columns form the main support of the structure and also carry the engine-room crane rails. The eastern and the northern fronts of the power house are provided with rows of large windows. The ground floor contains the condensers and air filters, arranged between the turbine foundations. The cooling water outlet duct runs along the eastern front of the building.

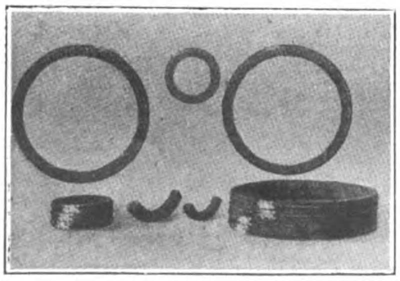
The switchboard-room is reached by two sets of stairs from the engine-room. It has an area of 35 by 28.5 metres and forms the communication to the adjoining busbar-room, containing the 6,600 volt and 33,000 volt-switchgear. The switch plant is a two-storied building. It contains in the ground floor the cells for the transformers. Full description of the switchgear will be given when describing the electrical plant. The whole of the plans were laid out with a view to future extension on a large scale.



Section Through Stuffing Box

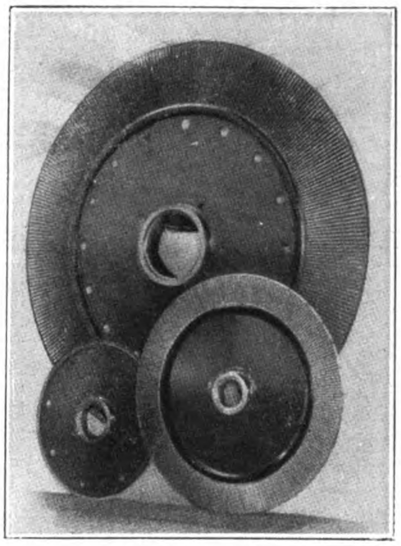
The Boilers and Auxiliary Machinery

The steam plant consists of four water tube boilers supplied by Messrs. Babcock & Wilcox Ltd., Glasgow, each with a heating surface of 419 sq. m. and a steaming capacity of 10,500 kg. per hour at 15 atm. and 360° C. superheat. All boilers are fitted with automatic chain grate stokers. The boilers consist of a number of individual layers of tubes fitted together, one above the other. The superheater consists of serpentine steel tubes with a total surface of 122 sq. m. It is inserted between the water tubes and the drums. The various elements are carried by a self-supporting iron frame work, which is filled up with masonry. The facings are provided with doors for cleaning and inspecting the boilers. Generally speaking the boiler plant presents nothing calling for special mention.



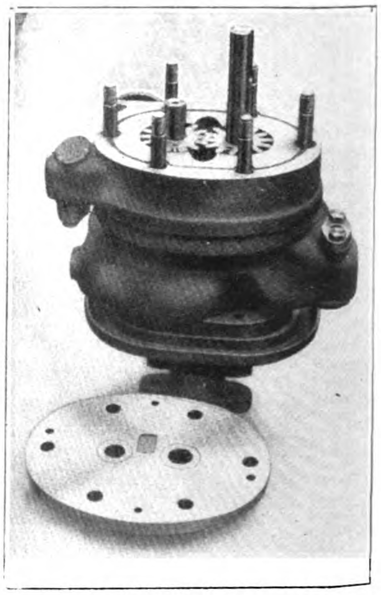
Carbon Rings for Stuffing Box

Between each boiler and the chimney flue Green economisers are installed each with a total heating surface of 248 sq. m. The boiler feed water is taken principally from the condensers. In order to compensate for losses, evaporators were installed. For water supply and storage of feed water two iron tanks are installed in the upper storey of the auxiliary machine-house. The feed water tank takes the turbine condensate as well as that from the evaporators. From the feed water tank the water flows to three feed water pumps installed below, two of which are intended for daily use and electrically driven, the third being driven by steam. The electrically driven pumps are centrifugal pumps by Messrs. Pumpen and Armaturenkonzern, Frankenthal and Weise Sohne, Halle and den Salle. They are capable of conveying 50 cubic metres water against a pressure of 175 metres and at 2,900 r.p.m. The pumps are driven by direct coupled a. c. motors of 55 h.p. at 380 volts. In order to insure the continuity of the feed in case of failure of the electrical supply, the third pump is actuated by a steam turbine of 150 h.p. at 3,850 r.p.m. It was supplied by the Maffei-Schwartzkopf Works, Berlin, and delivers 100 cubic metres against a pressure of 175 metres.



Turbine Runner Wheels

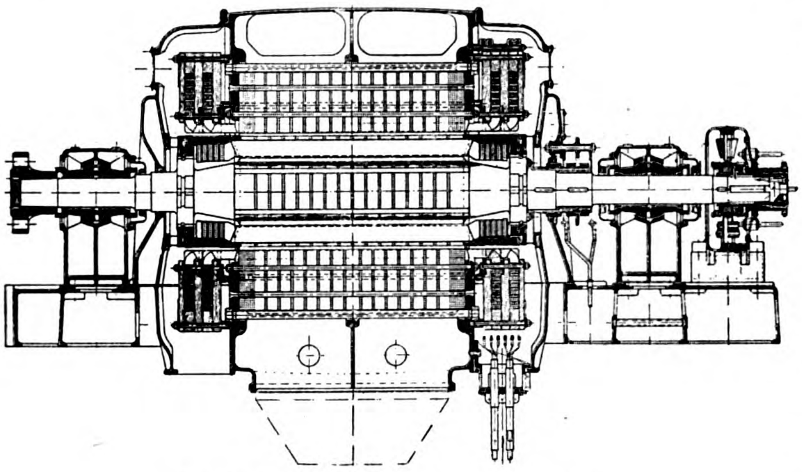
The evaporator plant, which furnishes the auxiliary boiler supply consists of three evaporators delivered by the Atlas Werke, Bremen, with a total capacity of 2,000 kg. distilled water per hour. They are heated by live steam from the boilers. The condensation of the distilled water takes place in the feed water tank. The untreated water required by the evaporators and for cooling purposes is taken from another tank situated in the upper storey. One electrically driven contrifugal pump is installed in the basement of the auxiliary machine-room to convey the untreated water from the water inlet channel to the tank above.



Gear Wheel Oil Pump

The Turbines and Condensing Plant

The first installation consists of two turbine sets with Zoelly steam turbines for 4,560 h.p., and three-phase alternators for 3,200



Longitudinal Section Through Generator

k.w. output each. The interior of the engine-room as illustrated shows only one set. The turbines were built by Friedr. Krupp, Germaniawerft, Kiel. The above output corresponds to a steam pressure of 14 kg. cm. (200-lbs. sq. inch) at a temperature of 350 centigrade at the inlet valve. The steam consumption of one turbine at full load can be supplied by two of the above-mentioned boilers.

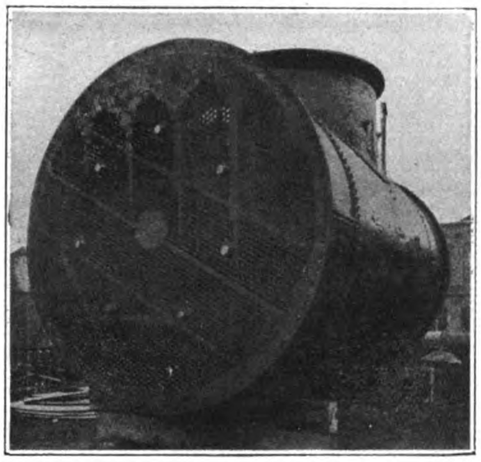
The turbines are impulse turbines and the principle on which they work is that the steam compounds solely in the stationary part of the turbine, in the guide wheels, so that differences of pressure in the blades of the runner wheels and consequently steam losses in the gaps between the two sets of wheels and axial thrusts are non-existant. The high-pressure live steam, after passing the governor valve, enters the turbine at an annular channel arranged in the end of the casing and is led from there to the blades of the first guide wheel. Here the pressure of the steam is reduced and its speed raised, its pressure energy being thus converted into kinetic energy. This first alteration is so chosen that the steam pressure behind the first guide wheel is reduced to about one-half of the admission pressure while the velocity has risen to about 450 metres a second. The purpose of the runner wheel, into which the jet of steam enters after emerging from the guide blades is to transmit the energy with as little loss as possible to the turbine shaft. The steam jet impinges on the blades of the runner wheel at a suitable angle and is thus diverted from its path. The resultant back pressure on the surface of the runner blades is converted into circumferential force, so performing work. During this process the pressure of the steam in the runner wheel remains unaltered, while its velocity decreases. The steam then enters the second guide wheel, where a similar process takes place and so on through a number of stages until the pressure has reached condenser level.

As the steam pressure at the entrance to each guide wheel is the same as that at the exit of the proceding one, it follows that the runner wheels of the turbine rotate in regions of constant pressure. Therefore it is impossible under ordinary conditions for the runners, as is the case with reaction turbines, to exert an axial thrust. Only in the event of sudden and violent fluctuations of the load would it be possible for a small difference of pressure to occur at both sides of each runner. In order to prevent the possibility of even such an occasional occurrence the runner wheels are provided with openings.

The fact that the pressure on both sides of the runner wheels is equal, permits the employment of ample clearance between these and the adjacent stationary parts of the turbine, viz., the casing and the guide wheels. This circumstance is of the greatest importance as regards safety in running in view of the high velocities of the runner.

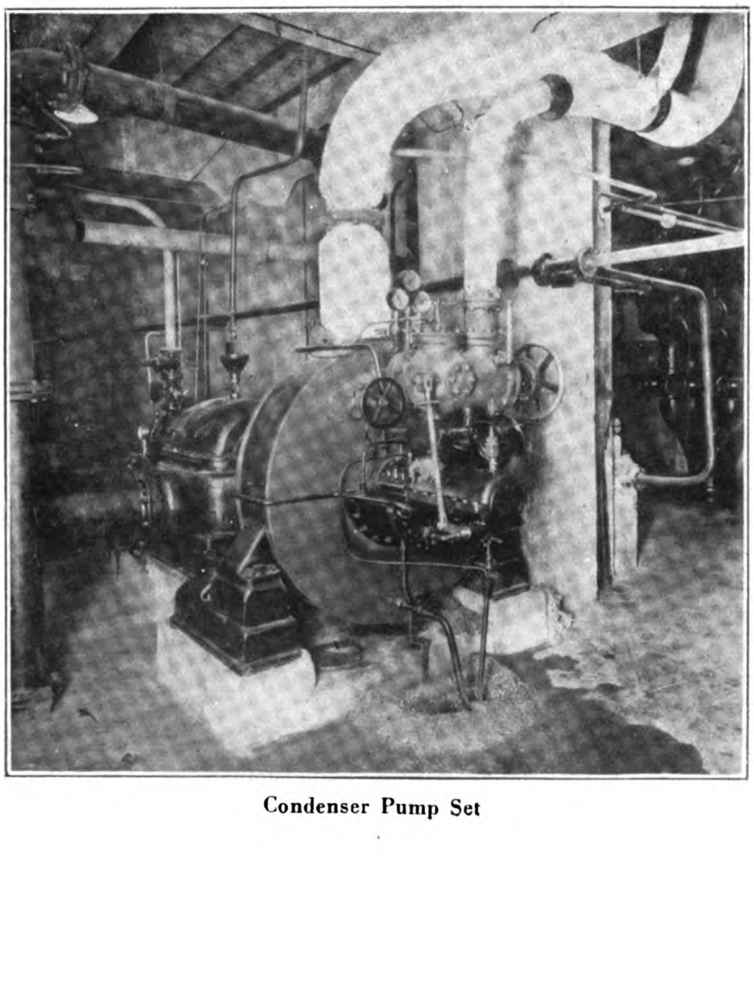
The runners are secured to the shaft by means of collars. This method of fixing prevents the runners from rusting to the shaft and facilitates their removal. The bearings are entirely separate from the casings in order to prevent the transmission of heat from the latter. A thrust bearing is provided on the high-pressure side, the function of which is to keep the shaft and runner wheels in the necessary fixed position in relation to the guide wheels, as well as to the generator. As a matter of fact, the actual thrust on the bearing is practically negligible, the impulse turbine, for the reason already explained, being free from axial thrust. The thrust bearing is so arranged that it moves freely, corresponding to the expansion of the turbine, and thus preserves the distances between stationary parts.

The bearing on the low-pressure side is united with the neighboring generator, bearing a common standard, which encompasses the coupling of the rigid pattern type built in between the two bearings. This arrangement of the bearings has not only the advantage that the bearings, but also the turbine stuffing boxes are easily accessible. The generator bearing at the exciter end is of the same constructon as the others. All bearings are lubricated and cooled by pressure oil supplied from a common gear-wheel pump and fed through suitable distribution piping. The turbine housing is split along the horizontal axis, so that on the removal of the upper half the runner wheels are laid open for inspection. It is supported on the baseplate by low and amply dimensioned feet, but is only bolted to the baseplate in the neighborhood of the exhaust steam outlet, so that movements due to expansion shall not be transmitted to the condenser, and to allow freedom for expansion in all directions.



Condenser

The head end of the turbine casing is convex and contains an annular chamber for the distribution of the steam. The relative positions of the turbine casing and the first guide wheel are such that the high-pressure steam on entering the turbine acts only on the surface of the annular channel, while those portions of the end casing in the neighborhood of the shaft are merely subjected to the much lower steam pressure existing behind the runner wheel. The stuffing box is thus only required to act against comparatively low-pressure steam and is just as easy to keep in order as in the case of turbine with velocity stages. The packing at both ends of the turbine shaft is carried in stuffing boxes cast on to the casing. They consist of a number of light carbon-rings which are made in several sections and pressed lightly on to the shaft by a spring. The rings require neither cooling nor lubri-

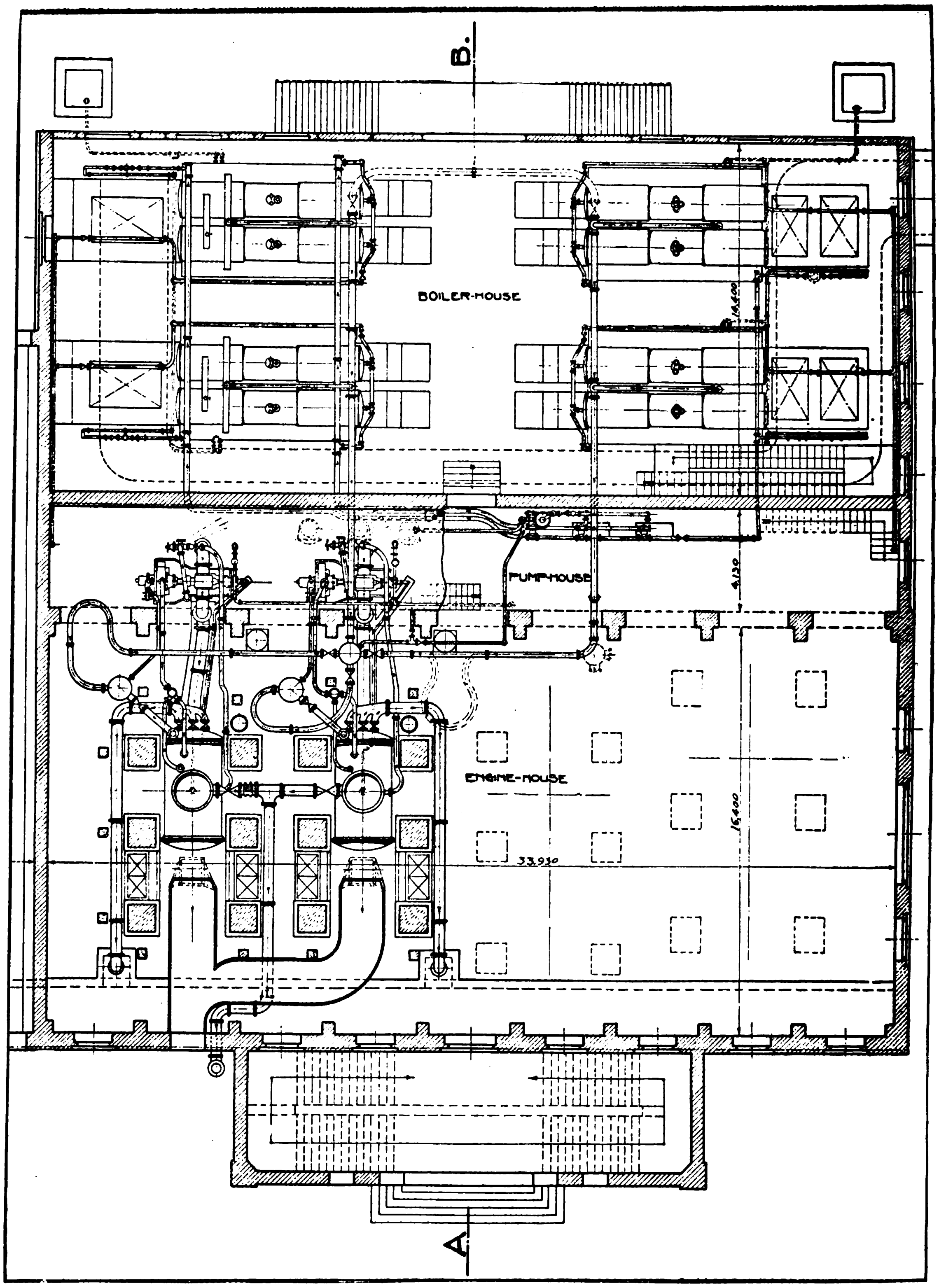


Condenser Pump Set

cating, so that no contamination of the steam by oil can occur and the condensed water can be used for boiler feeding. In a very short time these rings acquire a highly polished surface and thus ensure entire absence from wear on the shaft. The carbon rings are free to move in axial and radial direction without affecting the efficiency of the packing, so that in this respect also, a very high degree of safety is ensured.

The shaft is turned with particular care from high-grade open hearth steel and so dimensioned that absolute freedom from vibration is ensured. This is attained by balancing each runner wheel separately and afterwards re-balancing the complete runner, and furthermore by the choice of such dimensions for the shaft that a wide margin is afforded between critical and normal running speed. The shaft is a so called flexible shaft, that means the normal speed of the turbine lies considerably higher than the critical.

The runner wheels are forged, together with their hubs, from a solid block and then turned down to the form of a disc of uniform strength. The special care taken in the machining of the runner wheels enables the inevitable losses caused by steam friction to be reduced to a negligible quantity. The rims of the wheels are provided with T-shaped machined annular slots, in which the runner blades are consecutively inserted but separated from each other by correspondingly shaped distance pieces. The runner wheels are mounted on the shaft with particular care, intermediate rings being employed, upon which the wheels are shrunk, while the rings themselves are fixed comparatively loosely on the shaft. The runner wheel blades, being the most important part of the turbine, are manufactured with the utmost exactitude.



Ground Plan of Powerhouse at Tsenghua Transformer Room on left and Stack on upper right corner are not shown

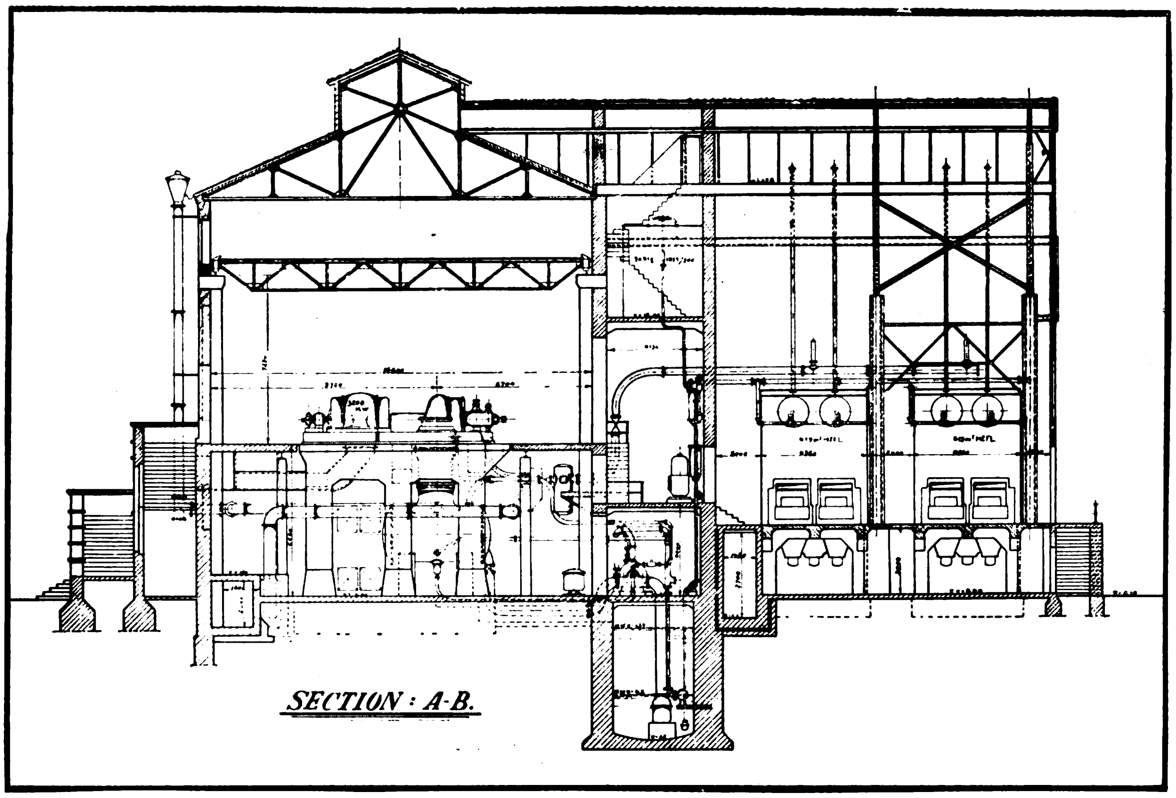
The blades are designed as bodies of uniform strength, stouter at the base than at the tip. By this mean the centrifugal force and the stress on the critical section are greatly diminished. In order to prevent friction and eddy losses the blades are covered on their outer circumference by thin steel-strips rivetted to the blade-heads.

The guide wheels are cast iron discs, split horizontally and inserted into the respective halves of the casing. The hubs enclose the hubs of the runner wheels on the shaft. Loss of energy due to the equalization of pressure differences is easily prevented by the insertion of labyrinth packing between the hubs of guide and runner wheels. The nickel steel guide blades are cast into the rims of the guide wheels and become so firmly embedded that to break loose is impossible. The guide wheels and blades are then subjected to careful machining to ensure smooth surfaces and accurate sections of the steam paths.

Lubrication is effected by a gear-wheel pump of simple construction but great reliability. The oil is pumped from a special oil tank to the lubricating centres and passes on its return through a reserve-flow oil cooler. Every turbine also is provided with an auxiliary oil pump, which takes over the lubrication of the bearing on shutting down. These auxiliary oil pumps are automatically operated.

The regulation of the steam supply is effected in the usual manner by means of a throttle governor. This kind of governing is generally the most advantageous for pure impulse turbines. The governor mechanism operates on the principle of the oil-pressure governor its characteristic feature being a throttle valve inserted in the main steam inlet, and carrying an oil-pressure piston on its extended shaft. This piston is controlled by means of pressure-oil through a control valve which is again directly influenced by the governor. Hunting is absolutely impossible with this method of governing.

Further advantages of this method of governing lie in its independance of the oil-pressure. This is due to the fact that in the cylinder of the servo-motor oil-pressure acts solely against



SECTION: A-B.

oil-pressure and not against spring tension. Only in the event of the oil-pressure sinking below a certain minimum is the turbine shut off automatically as a precaution against racing. Separate provision is made by hand and by means of an electric motor for varying the speed of the turbine by 5 per cent. as may be required for synchronising the generators.

A quick-closing valve as a safety device cuts off the steam to prevent the normal speed being exceeded by more than 10 to 15 per cent., either by the failure of the governor or the pressure-oil supply. The quick-closing valve is directly actuated from the turbine shaft so that in the event of the speed exceeding the prescribed limit the safety regulator on the shaft releases a ratchet, whereupon the spring closes the main valve. This valve can be closed by hand at any time in the event of impending danger. By means of an overload-valve, live steam can be admitted into a medium stage of the turbine, thus enabling it to be overloaded by 25 per cent. when running on the condenser. This overload valve is arranged to be operated by hand.

Each turbine-set rests on foundation pillars of reinforced concrete and the surface condenser is placed between these pillars. Each condenser is equipped with a pumping set, consisting of one cooling water pump, one air and one condenser pump. The cooling water pump is of the centrifugal type. The pumping set is driven by an auxiliary steam turbine fed with live steam from the boilers. The exhaust from these turbines is led to the low pressure end of the main turbines and thus fully utilized. The condenser is a cylindrical, horizontal vessel, consisting of strong boiler plates, with a tube plate at each end. The exhaust steam from the turbine is admitted into the space between the tube plates. These carry a large number of tubes, through which the cooling water flows, and which thus represent the cooling surface of the condenser. The ends of the condenser are provided with convex covers, and fitted with the connections for the inflow and outflow of the cooling water.

By means of partitions built in the water chamber and the tube plates the cooling water is compelled to pass several times from end to end of the condenser before reaching the outflow. In order to prevent as much as possible the deposit of sediment in the condenser and to secure good cooling action the water is made to flow at a speed of 1.5 to 2.5 metres per second. The steam enters the condenser through a conical connection from above and is caused to pass in the reverse direction to that of the water flowing in the tubes. The condensed water collects at the lowest part of the condenser, passing into a condensed water tank from which it flows under vacuum to the condensed water pump. The connection between the exhaust steam outlet of the turbine and the steam inlet of the condenser is made by means of a water-gland in order to equalize differences in expansion caused by the differing temperatures.

The condenser covers are provided with several large openings, giving access to the greater part of the tubes. Special lifting tackle is also supplied for removing the covers. The cooling tubes are of seamless drawn brass, an alloy suited to the purpose being employed. In the condenser the tubes are supported in the middle by a partition for the prevention of vibration and sagging which might otherwise lead to their early destruction. The tubes are of such a diameter as to secure a efficient exchange of heat and to enable easy clearing. They are secured in the tube-plates by screwed glands with stuffing boxes, this rendering an efficient packing and enabling the easy removal of the tubes, if necessary. A collar prevents their creeping in the direction of the water flow. The method of fitting the tubes in the tube-plates commonly used in boiler manufacture is not adopted here, as it prevents the tubes expanding and sooner or later leads to breakage.

The cooling water pump is amply dimensioned, not only to overcome the heat between water intake and outlet, but to cover the resistances inside the condenser (tubes, etc.). The inlet and outlet is so arranged that the water flows back to the pump on its own head, so that the pump has only the resistances in the pipes to overcome. Consequent on the low pressure in the condenser, the quantity of air to be dealt with by the air pump is considerable. For this reason and in order to ensure the rapid creation of a vacuum on starting-up only such air pumps can be used, which combine high delivery with absolutely reliability. Years of experience have shown that these conditions are fulfilled by water jet nozzle air-pumps. They are distinguished by simplicity of construction. The necessary water is supplied by a special high-pressure pump coupled with the cooling water pump.

The condenser water pump is also a centrifugal pump. The condensed water, with a mean temperature of 30° C., being under the vacuum of the condenser must therefore be made to flow into the pump. The vacuum obtainable is 93.3 per cent. The pump is designed for a head of 25 metres, corresponding to the local situation and is generally speaking so arranged as to deliver the condensed water directly into the boiler-feed water tank. The pumping sets are so placed as to be easily accessible and to give short lengths of piping to the condenser. On the other hand the cooling water pumps are in the immediate neighborhood of the suction intake.

The cleaning of the condenser is of great importance. Even a comparatively thin deposit of sediment or mud greatly diminishes its efficiency and particular attention has been paid to the question of easy and efficient cleaning. Much cleaning is saved by providing sieves in the intake. Aside from these sieves a special method of cleaning the condensers has been adopted. It must be borne in mind that the oftener the cleaning is performed, the easier and more effective the process is, a thin deposit of dirt being much more quickly and thoroughly removed than a thick hard crust. The system which best meets the conditions is the so called "Hülsmeyer" patented cleaning system, in which the water is compelled by suitable deflectors to take its way through certain groups of tubes only, the velocity of flow being thereby naturally greatly increased, and the deposit of dirt, etc., effectively swirled out. The process may be daily or several times a week and by giving a few minutes to each group of tubes the condenser will for practical purposes remain clean. As before mentioned the condenser pump is driven by a steam turbine and the cleaning effect can be considerably heightened by raising its speed and thus increase the water pressure.

The Turbo-Generators

Coupled to the turbines are two turbo-generators. They are of the usual Siemens-Schuckert type built for the following conditions :—

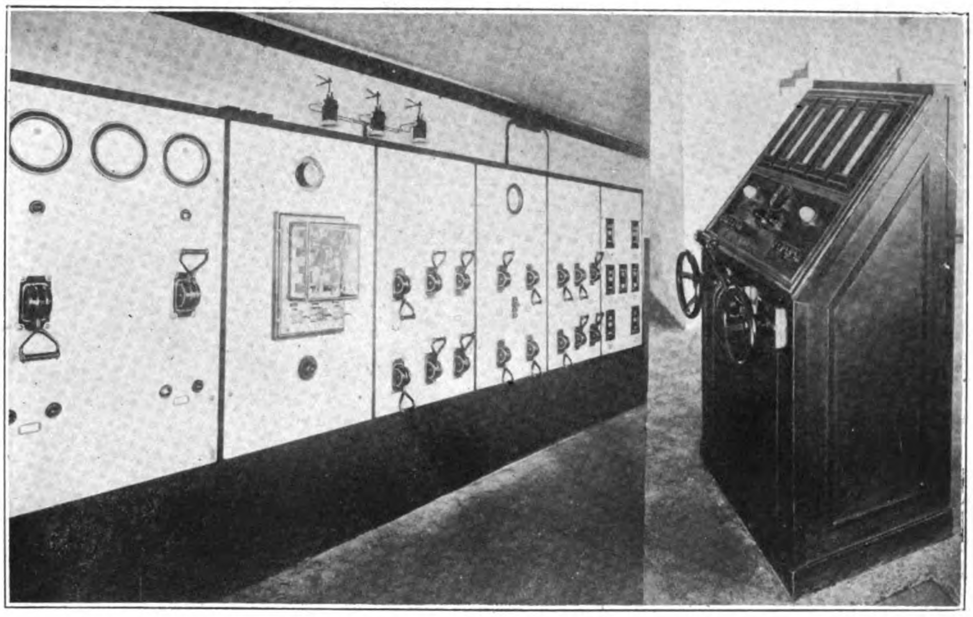
Output	3200 k.w. at.
Voltage	6600 volts
Speed	3000 r.p.m.
Frequency	50 cycles p. sec.
Efficiency at full load and cos. = 1	= 0.96

They conform in every respect to the German regulations, which are stipulated for all electrical machinery.

It is only intended here to refer shortly to a few points which have particular bearing on the character of the generators as turbo-generators.

The stator consists of a rigid cast-iron shell, which carries the active iron form of laminated plates held together by side plates and bolts. The stator windings are carried in semi-open slots in the laminated iron, which in their lower parts form ventilation ducts. Generally speaking the stator is provided with ample axial air ducts, which carry away the heat generated in the active iron by means of the cooling air flowing through them. The stator winding is carried out as a bar winding, all measures being taken to ensure good insulation and protection against mechanical stresses.

The stator is closed on either side by endshields provided with ample openings. These facilitate inspection and at the same time prevent accidental contact with rotating or live parts.



Switch Gallery with Switch Board and Switch Desk (for one Generator) on right

Particular care is taken in the construction of the rotating part of the machine, the rotor above all, with regard to the exceptionally high peripheral speeds and the centrifugal stresses caused thereby.

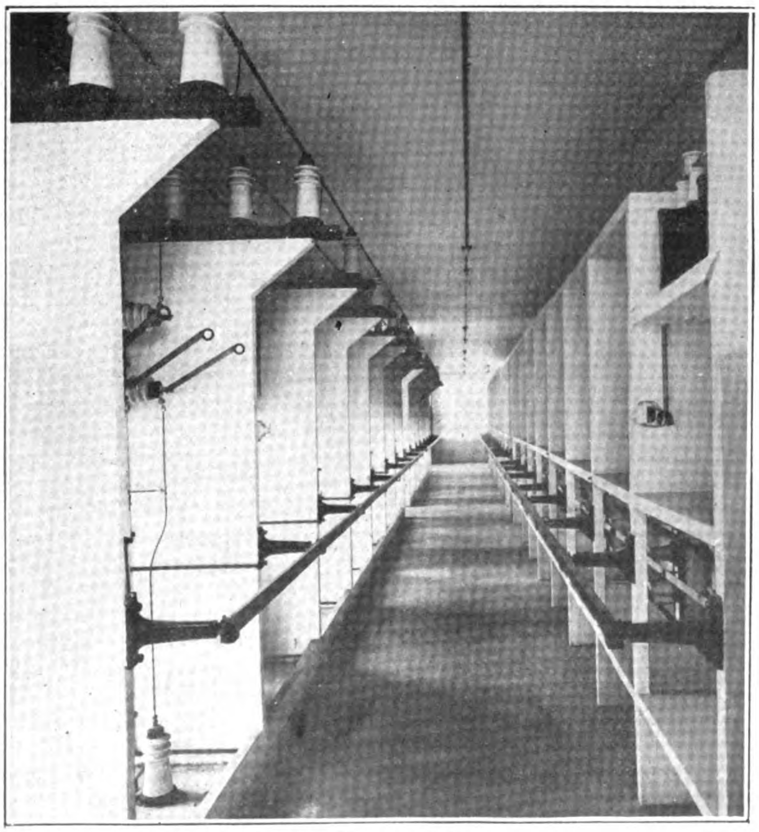
The rotor core is forged in one piece with the shaft and is wholly cylindrical. The ends of the coils are secured against centrifugal stresses by metal caps to which fans are connected at each end for the creation and distribution of the necessary cooling air.

The shaft with rotor is balanced in the same manner as the turbine shaft, so that smooth running is assured. The shaft is calculated on the same principles as that of the turbine in regard to the critical speed, so that in combination with the rigid coupling between turbine and generator the rotating parts of the set comprise a unit of mechanically simple and sound construction ensuring the highest imaginable degree of reliability in service.

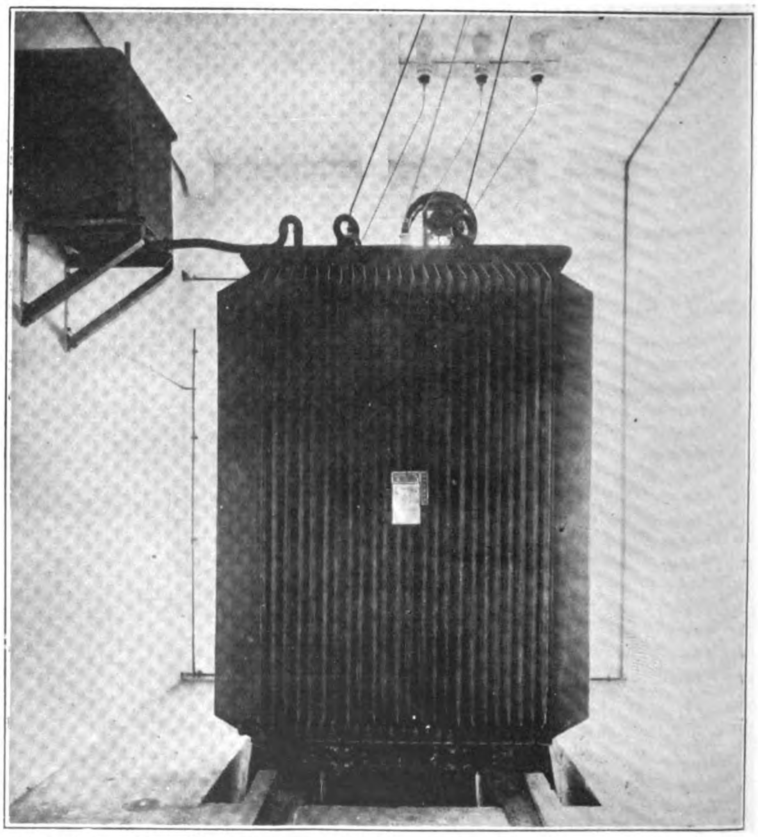
The rotor and stator are erected in such a manner that the centres of their magnetic fields exactly coincide, thus obviating any axial pull on the turbine thrust-bearing. Provision is at the same time made for heat expansion.

The rotor runs in ample bearings which in design and outward appearance correspond to the turbine bearings. They are bolted to the bedplates and can be adjusted by liners to the exact level. Lubrication is effected by the same apparatus as for the turbine. Due precaution is taken to prevent oil leakage and waste.

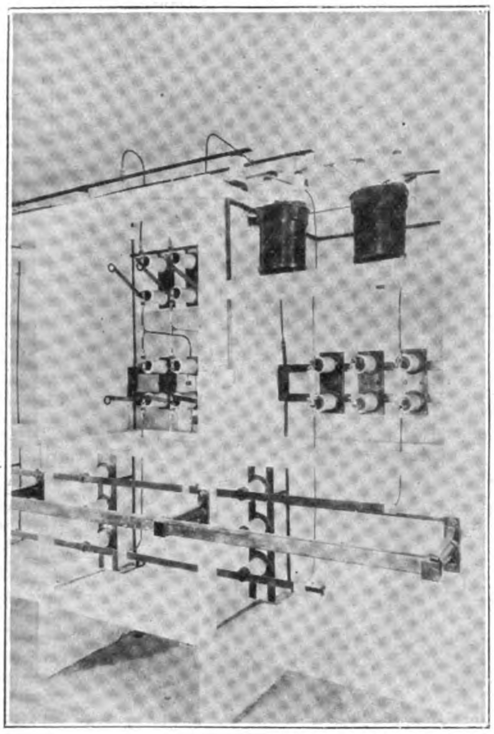
The cooling air is drawn in at both sides of the frames through a special air duct, passing a filter on its way. The hot

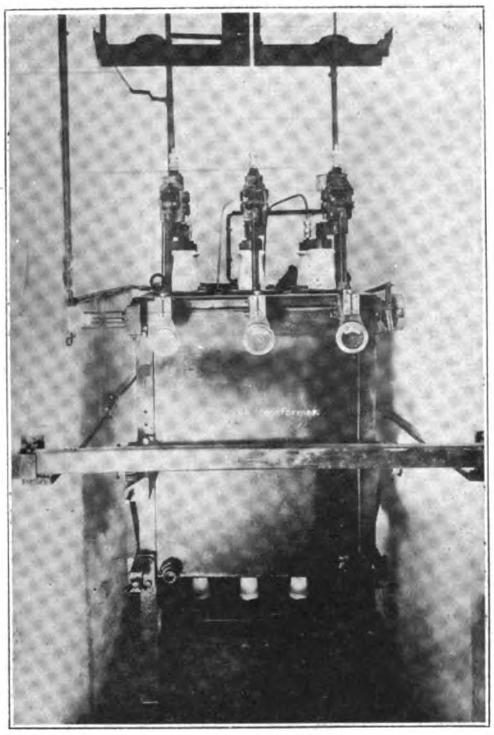


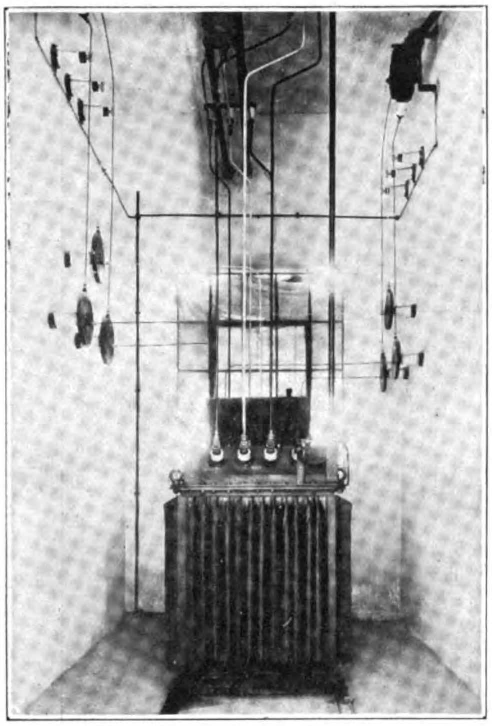
Busbar Cells for 6,600 and 33,000 Volts

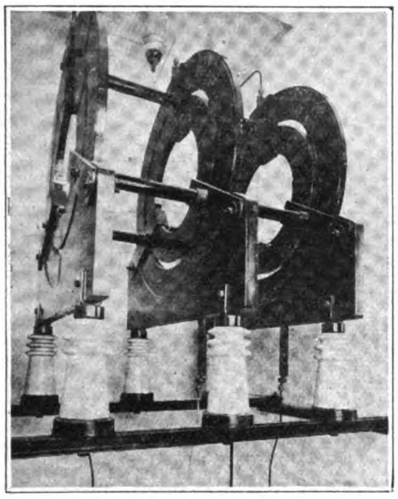


2,000 k.v,a. Main Transformer—Oil Expansion Chamber on Upper Left

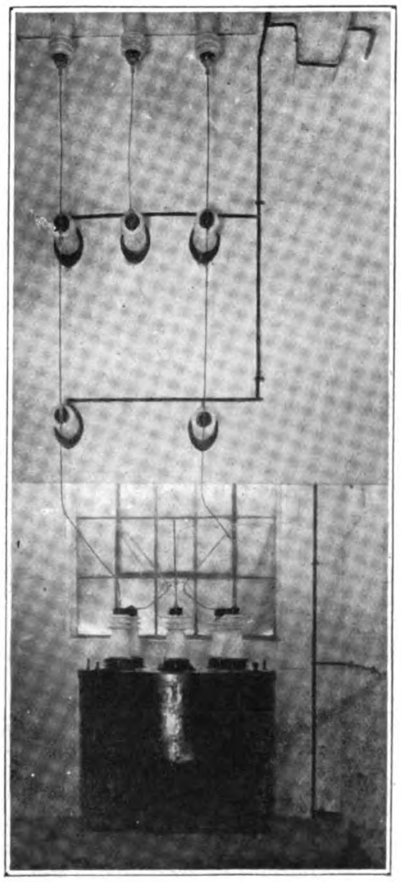








Above to left is the 6,600 Volt Meter Cell—In the centre is one of the Oil Switches for the 2,000 k.v.a. Transformer and on the right is shown the Type of Station Transformer. Below to left are the Choking Coils and on the right is one of the "Hornbreak" Type Lightning Arresters that Protect the 33,000 Volt Busbars



air is discharged through an opening in the centre of the lower part of the stator and is led back through a duct into the open air.

The generators are excited by directly coupled dynamos at 110 volts. The excitation energy for each generator is 23 k.w.

The voltage regulation is effected by a rheostat in the field of the exciter. For keeping constant voltage a Siemens automatic regulator of the high-speed type is used.

Before leaving the test bed the generators were subjected to a short-circuit test under full excitation. The generators have fulfilled this test without the slightest difficulty.

The Main Transformers

For stepping-up the voltage of the generators, from 6,600 to 33,000 volts two main transformers of the shell type for 2,000 k.v.a. output each are at present installed. The transformers are built for self-cooling. They are so designed and dimensioned, that the highest temperature rise in the windings is about 70° C. as prescribed by the regulations of society of German electrical engineers. The temperature rise in the warmest strata of the oil is about 55° C.

The individual packets of transformer iron are held together by powerful clamps, so constructed that on removal of the cover, the transformer can be easily braced up. Special provision is made in the design for channels in which the oil can circulate so as to ensure adequate cooling of all parts.

The coils are composed of flat formed wound turns arranged in a single layer one above the other. The first section of the winding is specially insulated as a protection against the inrush of dangerously high voltages. The windings are amply subdivided to prevent magnet leakage.

The individual groups of coils are separated from each other by layers of presspan with ample overlap and by oil ducts. The number of these latter is so chosen, that each coil is brought into direct contact with the oil flow. The heat generated in each is thus imparted straight to the oil without having to pass through several layers of insulation. In this way the temperature throughout the transformer nowhere exceeds the permissible limit. As a precaution of safety against short circuit the windings are stayed in all directions amongst themselves and against the core.

The transformer stands in a portable wrought-iron case, the sides of which are wholly corrugated. As will be seen from the illustration, the corrugation are deep and therefore efficient as regards cooling.

It is essential for the reliability of oil-cooled transformers that the oil remains permanently in good condition and free from water Expirements have demonstrated the fact that hot oil, if in immediate contact with air, absorbs oxygen from the atmosphere and undergoes a chemical change. To protect the hot transformer oil from contact with the air and thereby from decomposition, each transformer is provided with the well-known Siemens-Schuckert "oil-expansion chamber" It consists of a vessel, which mounted separately above the transformer tank and connected by a U-shaped pipe with the interior of the same. After the tank has been filled with oil, the pipe is screwed to the lid and the vessel likewise partly filled. The hot oil in the transformer is thereby separated from contact with the air by the cool oil in the vessel.

The oil-expansion-chamber prevents at the same time the formation of condense water in the transformer tank. Transformers without oil-expansion-chambers are subject to the further disadvantage that following on the contraction of the oil, which takes place every time the transformer cools down, air is drawn

into the tank, thus imparting moisture to the oil. In order to prevent any condense water which may be formed in the expansion chamber from reaching the interior of the tank, the U-shaped connection pipe is fitted at a certain height above the bottom of the vessel. A drain cock is provided at the lowest point of the expansion chamber which permits to test from time to time the oil of the lower strata and to remove any water which here may have collected.

The oil-expansion-chambers are equipped with a safety valve which comes into operation when the transformer contains too much oil, or when some internal damage causing the development of gas should occur.

Both the high- and the low-tension terminals are of porcelain and of a special design. The live parts of the terminals are under oil, so that the formation of ozone, which would greatly accelerate the deterioration of the oil is prevented.

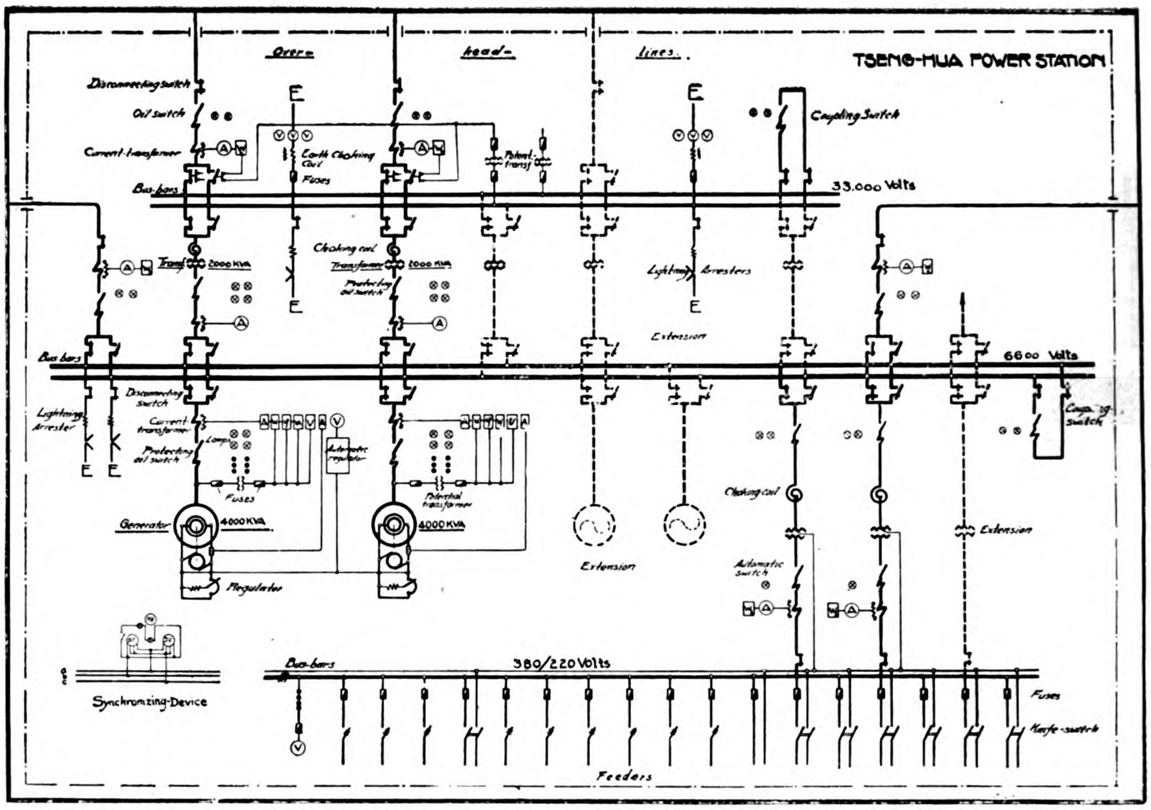


Diagram of Connections in the Main Power Station

The Transformer for the Power Station Supply

For feeding the various auxiliary motors in the power station the voltage of 6,600 volts as supplied by the generators is not suitable. Therefore two transformers were installed for the station supply. Each transformer has an output of 150 k.v.a. and is self cooling. The ratio is 6,600/380/220 volts on no load.

The Switchgear

The connection diagram of the power station shown above, is particularly simple. The turbo-generators are connected to double busbars for 6,600 volt and from these to the two main transformers, which similarly are connected on the H. T. side to a further system of double busbars for 33,000 volts, from which the two 33,000 volts transmission lines emanate.

From the 6,600 volt bus two lines lead out, of which one goes to the Lee-Ming-Spinning Co. and one to the transformer station in Tsishuyen.

Each of the system of busbars, the 6,600 volt as well as the 33,000 volt system, can be coupled by means of special oil switches. It is thus possible to work either on each busbar system separately, or on both together, on the L. T. as well as the H. T. side, and the transference from one system to the other can be effected with ease.

The instruments and switchgear side are of the usual type and do not call for special mention. Only a short description of the installation may be of interest.

As a protection against dangerously high voltage the main transformers are provided on the H. T. side with choking coils in each phase.

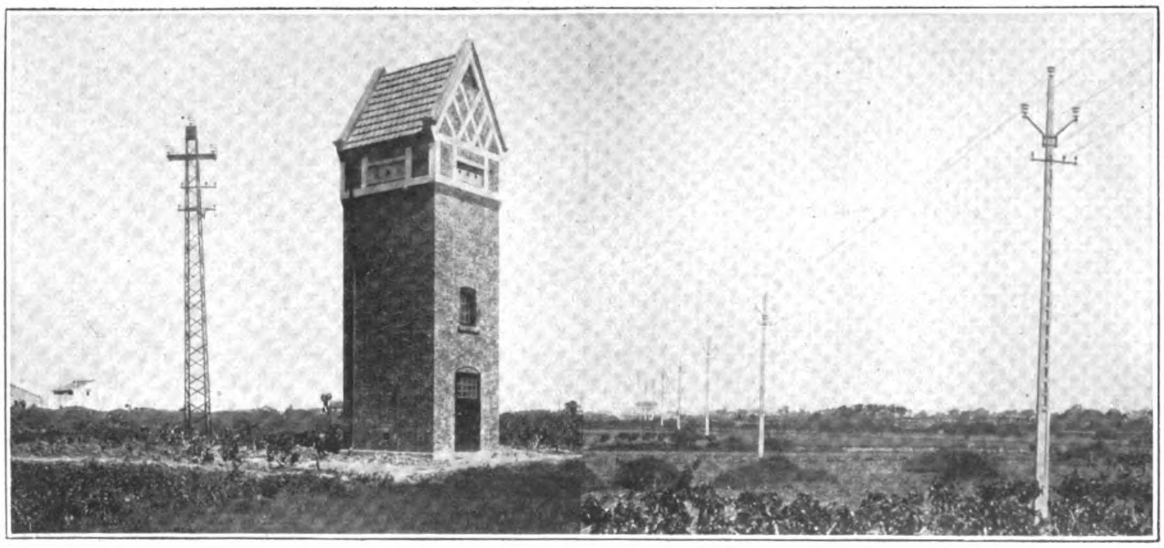
Each busbar system is equipped with a high voltage protection device consisting of horn—break arresters connected in star delta series with oil resistance in each phase.

The danger of static discharges have been avoided by the choice of earthing coils, which are connected to the 33,000 volt-bus. The earthing coils are made with a secondary winding to enable the connection of voltmeters for measuring the voltage between phases and earth. All of the above mentioned apparatus are connected to the busbars by disconnecting switches.

Each of the outgoing transmission lines can be connected by means of disconnecting switches with each of the two busbar systems. For switching on and out under load each line is provided with a oil switch with protective resistance and maximum relays in each phase. In order to protect the switches from reverse current from the line, when in the "off" position, another set of disconnecting switches is inserted.

The general arrangement of the switchgear and instruments is as follows: The switch gallery contains of a switch desk and a switch board with 9 panels. The desk carries the controlling apparatus for the generators, regulator gear, instruments and signal lamps.

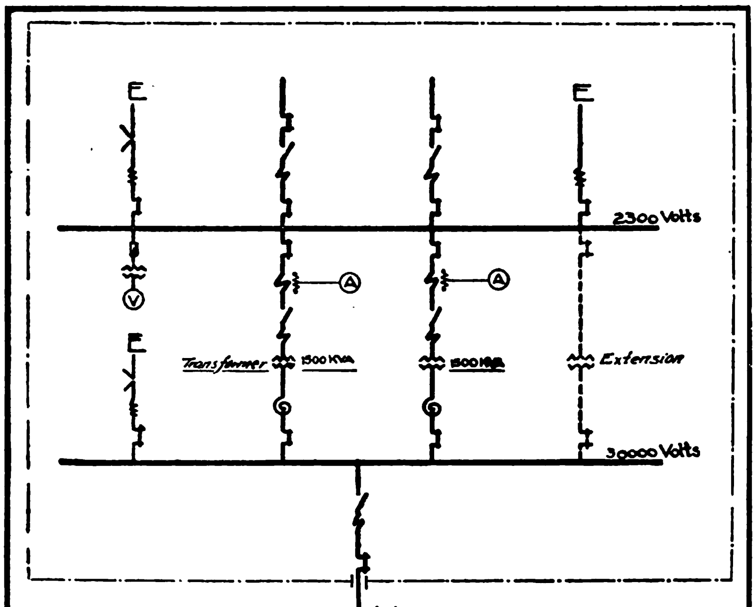
When the ultimate extension is installed, it will consist of four similar sections for the apparatus and instruments



Type of Iron Pole and Transformer Station at Tsishuyen—On Right is the 33,000 and 6,600 Volt Transmission Line

for the turbo-generators and one centre desk, which contains the synchronising instruments. Behind the switch desks is arranged the nine panel switch board, for the distribution, which contains all the other apparatus for the 6,600 and 33,000 volt plant. The high tension apparatus for 6,600 and 33,000 volts are distributed over two storeys of the switchgear house.

The ground floor takes the cells for the main transformers and the 33,000 volt high-tension protection device. The two transformers for station supply are also installed here.



MAIN SUBSTATION WUSIH

On the first floor are the cells with the oil switches, the 6,600 volt high-tension protective device and the metering cells with the necessary current and voltage transformers for the generator instruments. These cells as well as the other cells for 6,600 and 33,000 volts are built up of concrete.

On the second floor, *i.e.*, on a level with the switch gallery are the busbar cells for 6,600 and 33,000 volts together with the meter cells for the watthourmeters, arranged in two opposite rows. Underneath the switchboard floor are the magnet regulators for the turbo-generators.

The oil switches are built as single tank switches. They are fitted with relays in each phase fed by the high tension current and connected by insulating rods to the retarding mechanism, by means of which the current and the time can be adjusted. This can be effected when the switches are in circuit. The switches are operated by hand. Every oil switch has a special signal lamp controlled by auxiliary contacts on the respective switches, so that the exact state of the connections can be recognized by the attendants at any minute.

The connections with the oil switch cells are carried through wall bushes, to avoid openings in the ceilings which would favored the spreading of a fire.

Special attention was paid to the earthing of all metal not under tension. For this purpose conducters of 6 by 20 m.m. strip-iron run through all cells and are connected to the iron frame work of the apparatus. These main connections are linked up to two separate galvanised iron plates, which are embedded at a depth of about 3 metres in the earth.

The Main-Substations at Wusih and Changchow

The main-substations at Wusih and Changchow are both built to the same design; a description of one will therefore apply also to the other. The only difference which exists, is in the size of the transformers. In the Wusih substation two transformers are provided each for an output of 1,500 k.v.a. while in the Changchow substation each of both transformers has an output of 1,000 k.v.a. Corresponding to the incoming voltage their ratio is 30,000/2,300 volts. They are connected in star/star. The connections in these substations are practically the same as those of the central-station and is again comparatively simple. The incoming supply at 30,000 volts goes to busbars and from here through the two main transformers to the 2,300 volts-busbars. Connected to these are the chief consumers.

The arrangement of the apparatus is also the same as at Tsishuyen, so that a repetition is unnecessary.

The cells for the oil switches for the transformers and outgoing feeders for the transformer themselves are placed on the ground-floor while the top floor contains the 30,000 and 2,300 volts busbars with the disconnecting switches.

All the cells are surround by wide passages, so that the whole plant can be inspected without any difficulty or danger. All accessible parts which might be accidentally touched, are earthed.

The Overhead Transmission Lines

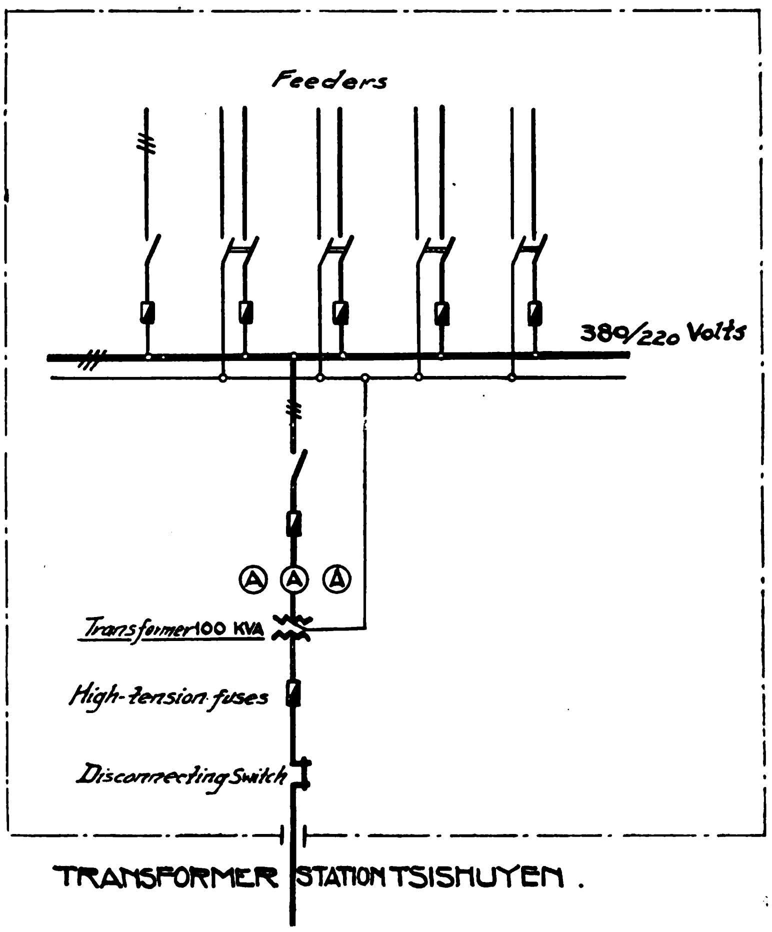
At present two lines for 33,000 volts lead out from the central station, of which one goes to Wusih and one to Changchow; two other 6,600 volts lines supplies the substation of Lee Ming Spinning Co., of the village Tsishuyen.

The material used for the conductors is stranded wire 3 by 25 sq. mm. and is pure hard-drawn, electrolytic copper. Special attention has been paid to joining the ends of the wires. Instead of the usual twisted joints the ends are connected by the approved Siemens grooved joints. By means of this kind of joining the tensile strength of the joint is 90 per cent. higher than the strength of the conductor itself.

The conductors are carried on reinforced concrete poles, mostly 10.4m. high, usually placed about 80 to 90 meters apart. Wooden poles are only used in the 2,300 volt lines between Changchow substation and the Changchow Cotton Mill.

The insulators for the main lines, supplied by the Hermsdorf Porzellanfabrik, are of the well-known petticoat type, with prominently projecting sections between the top and bush surrounding the support. In this manner direct sparking between the top section and the support is prevented, because the surface leakage path, along with the current could creep, is considerably lengthened.

The insulators are fixed to the supports with hemp.



TRANSFORMER STATION TSISHUYEN.

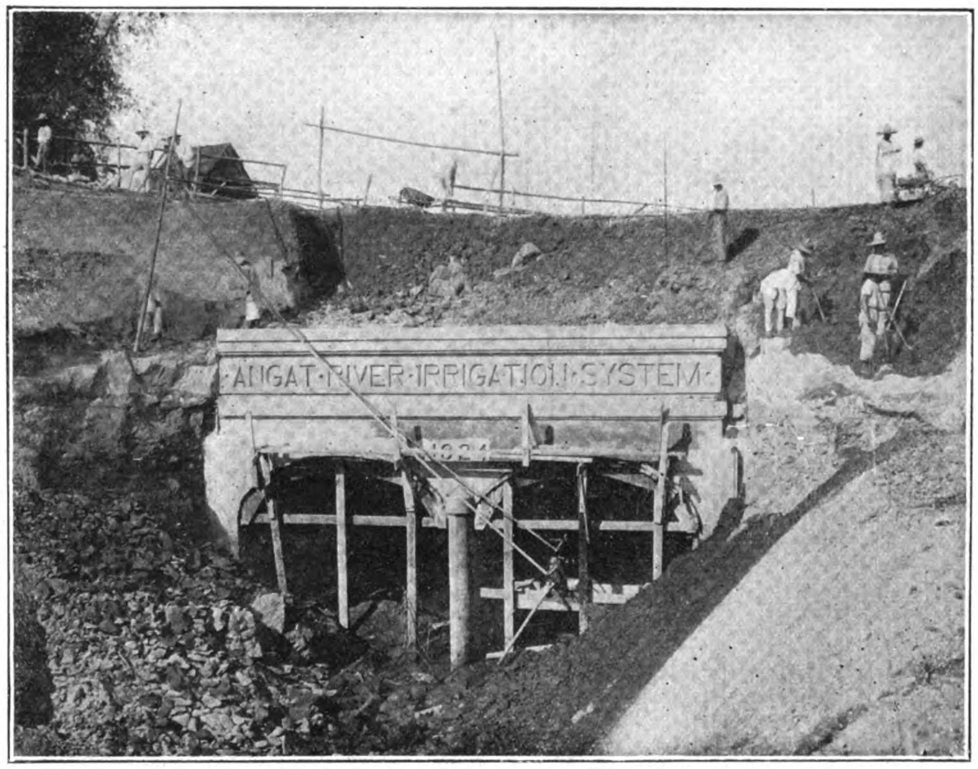
At regular interval of 2.5 to 3 Km along the line in accordance with local conditions special iron poles are erected to withstand the extra pull that might be produced in the case of a break.

Protecting network is provided at all places, where other overhead lines or telephone lines are crossed.

The Angat River Irrigation System Philippines

By Nicanor Cortes, Designing Engineer, Bureau of Public Works

THE Angat river irrigation system is the largest and is otherwise representative of the 16 projects commanding an aggregate area of 64,535 hectares and estimated to cost completed P.10,662,500 (P.1.00 peso=$0.50 U. S. currency) which are now in operation or are under construction since the inauguration in 1918 of the irrigation construction program of the Philippine government. This program was embarked upon with the view of insuring against droughts and increasing the production of rice, the staple food of the Filipinos. During the period from 1899 to 1918 there were imported into the Philippines, 3,601,414 metric tons of clean rice valued at P.242,585,120 which represent an average annual importation of 180,071 metric tons—3,100,000 cavanes in the Philippines—valued at P.12,129,256. It was estimated that an investment of P.20,000,000 in bond issues, in addition to appropriations from current government revenues made from 1918 to 1921 amounting to P.3,297,000, would place under irrigation a total area of 160,000 hectares, thereby increasing the annual production of rice by at least 180,000 metric tons, sufficient to meet the country's average annual shortage of the cereal. What follows is a brief sketch of the Angat river irrigation system intended to give a glimpse of what has been accomplished in this undertaking and of the conditions obtaining and problems encountered in the Philippines in carrying out irrigation construction work.



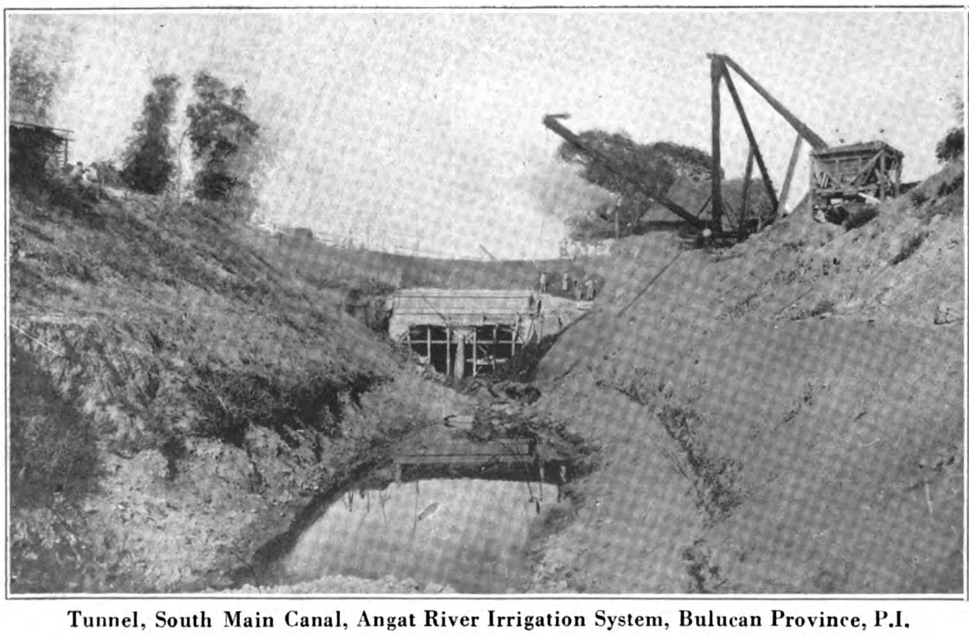
Main Canal, Tunnel in the Distance, Angat River Irrigation System.

The Irrigable District

The district comprises 25,000 hectares of land, 10,000 being on the north side of the Angat river, the source of supply, and 15,000 on the south side, the centre of the whole area being 40 kilometres north of Manila. The lands have been under cultivation for years and are among the finest agricultural lands to be found in the Philippine archipelago. The market value of these lands ranges from P.400 to P.2,000 a hectare, the average being about P.1,000. The district is one of the most thickly settled regions in the islands, the total population of the 10 towns benefitted being over 112,000. Practically all of the lands under the project are owned by the residents although there are many people living in the district who do not own lands and cultivate only two to four hectares. Landholdings are relatively small, generally less than 15 hectares, and there are only a few larger than 100 hectares.

Crops Grown and Need for Irrigation

Almost the entire area under the project is devoted to growing one crop of rice a year, but it is actually producing a relatively low yield owing to the insufficiency of rainfall to satisfy the water requirements of the rice plant. On the average two crop failures have been reported out of every five planted. A small portion of the area is used for growing sugar cane, corn, tobacco, and vegetables. It is estimated that the yield of rice will be increased under irrigation 30 to 60 per cent. over the present average of 1,250 kilos of rough rice per hectare. Unhusked rice commands in the district a price which rises from P.0.06 a kilo just after harvest time to P.0.11 a kilo just before the following crop is harvested.


Tunnel, South Main Canal, Angat River Irrigation System, Bulucan Province, P.I.

Transportation and Market Facilities

The transportation facilities of the district are among the best to be found in the country. Automobile macadamized roads, besides many inferior ones, traverse the entire tract from north to south and from east to west.

Numerous passenger and freight trucks are making regular runs over these roads. Railroad lines radiating from Manila cross the centre from north to south and traverse the southern and western boundaries. The project is located near great centres of population, where the anticipated increase in production will find a ready market.

Water Supply and Water Demand

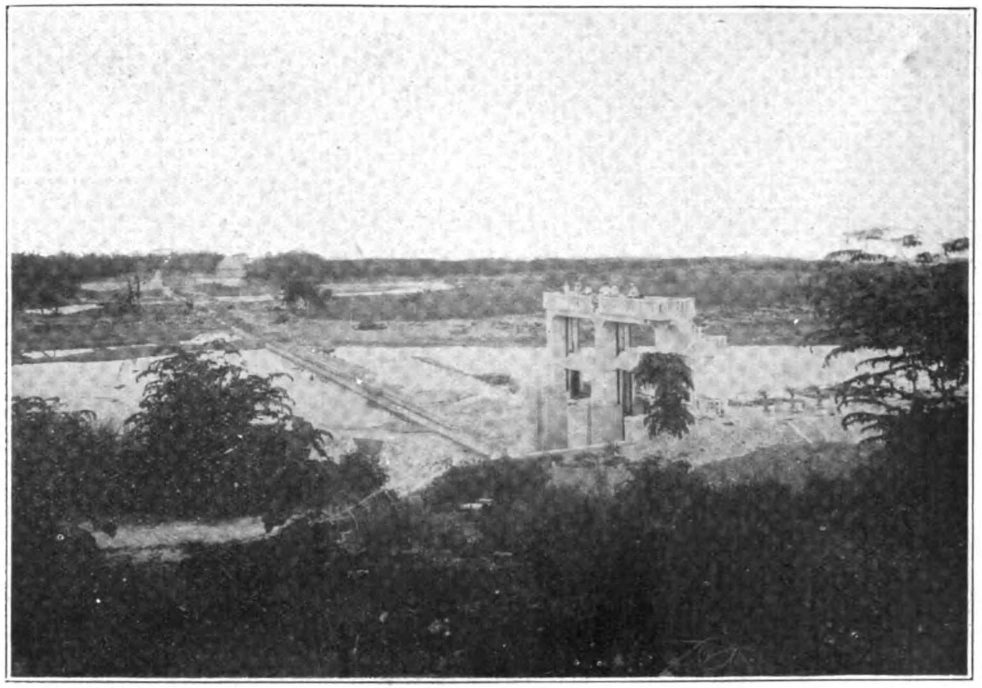
A continuous record of the flow of the source of supply, kept from 1909 to date, excepting the period from 1914 to 1917, shows that there is sufficient water available to supply the anticipated demand. The diversion required is 1.5 second-liters per hectare, which rate is usually used in lands to be irrigated with soils and sub-soils of heavy texture, such as prevail in this project and in most rice regions in the Philippines. This rate covers evaporation and seepage losses in the main canal and laterals and has been determined for the irrigation water to be supplied in a very dry year, which is liable to occur once in five or six years. The maximum diversion is, therefore, 15,000 second-liters for the 10,000 hectares of rice land located on the north side of the river and 22,500 second-liters for the 15,000 hectares of land on the south side. The irrigation season begins in May and June when nursery beds are prepared and ends in November and December when the crop is harvested. Transplanting is done in June and July.

Official records show that there are no water rights on the Angat River except those reserved for the proposed extension of Manila waterworks system. Water-rights in the Philippines are based on the doctrine of appropriation and are appurtenant to the lands. Their basis and measure and limit is the beneficial use. Difficulties in the apportionment of water arising from water-right controversies are not anticipated.

The Irrigation Plan

The irrigation plan of this system provides for the diversion of water from the Angat River by means of an overflow dam located near the town of San Rafael into two main canals, north and

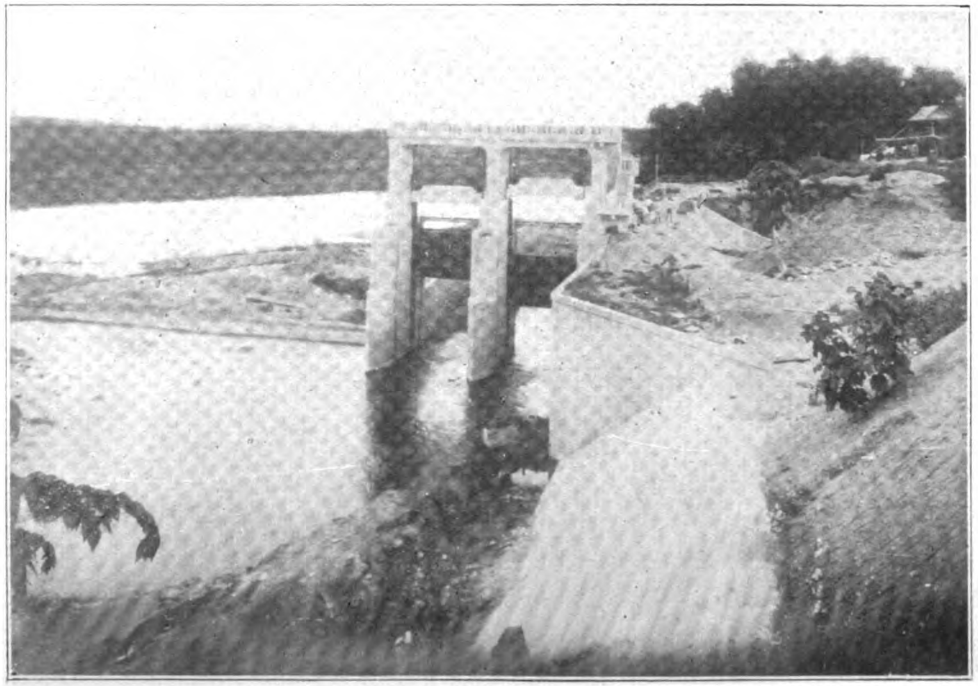
ANGAT RIVER IRRIGATION SYSTEM, DIVERSION WORKS

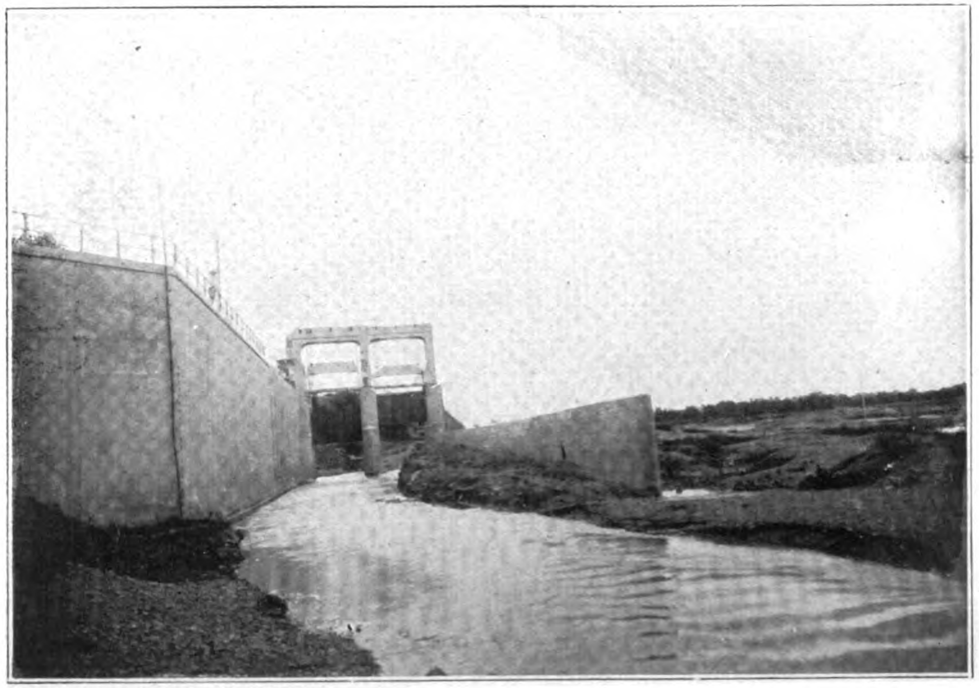


SOUTH HEADWORKS IN FOREGROUND

Looking North Approximately along the Axis of Dam

Looking at an Angle with the Dam Axis

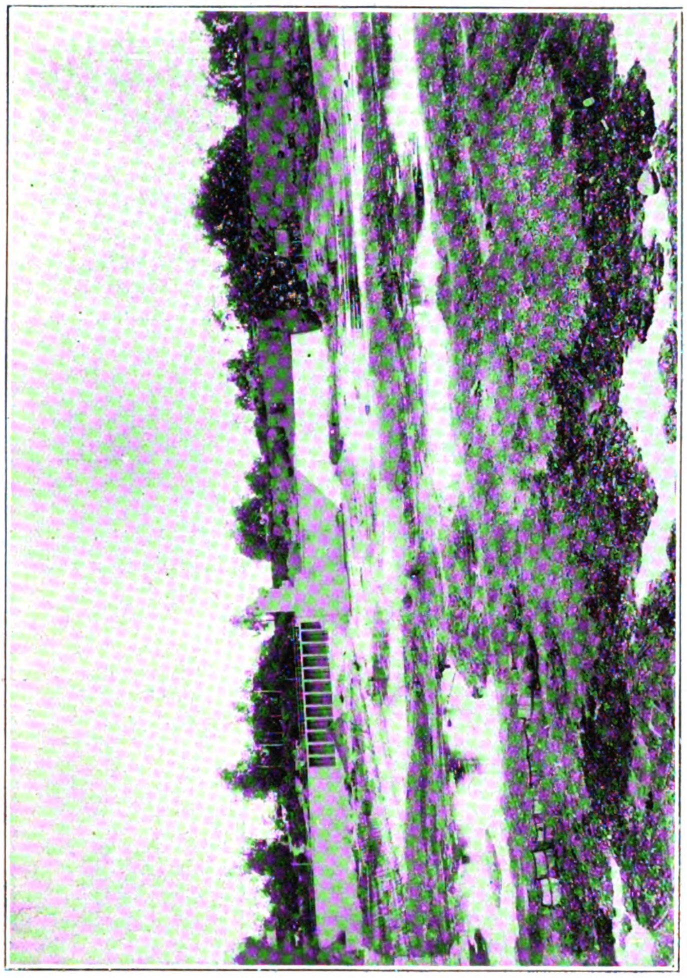




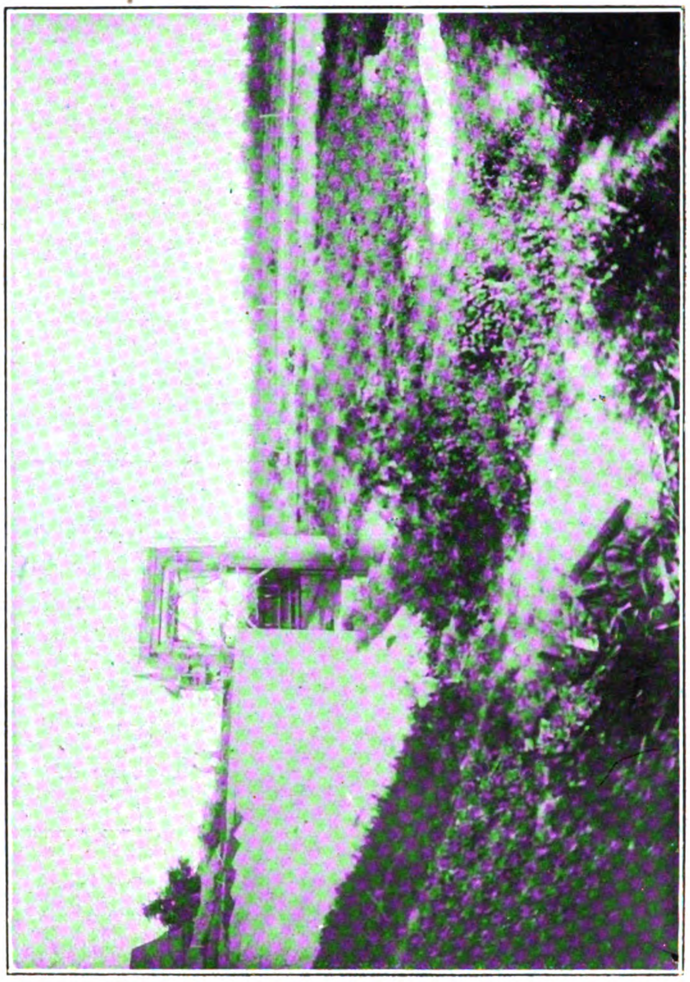
SHOWING SLUICE GATES AND OPERATING PLATFORM

Downstream View of South Sluiceway Channel

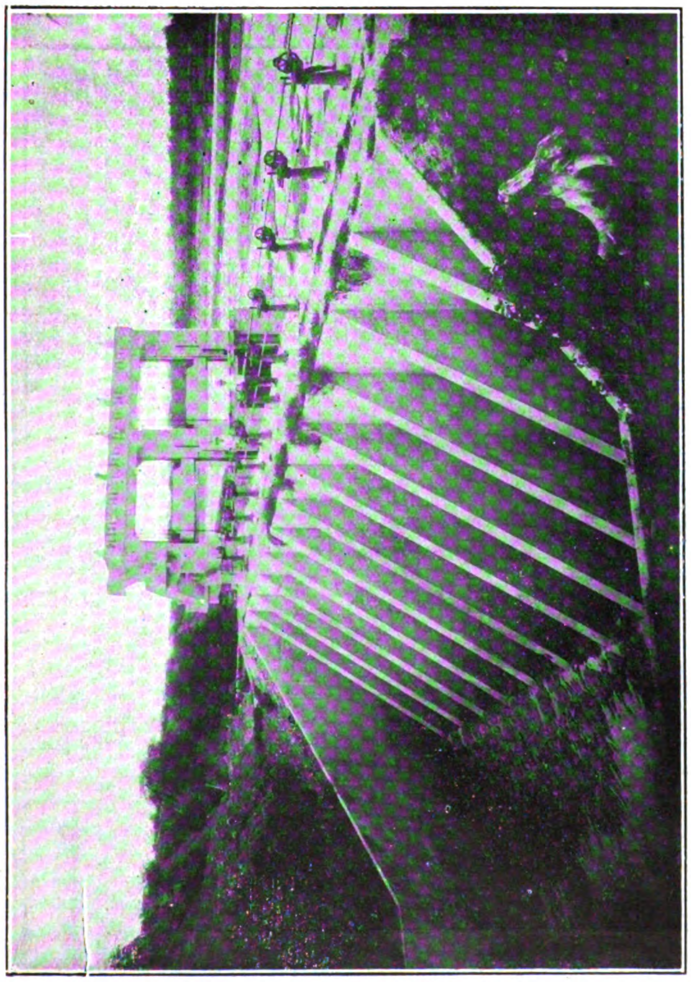
Upstream View of South Sluiceway Channel



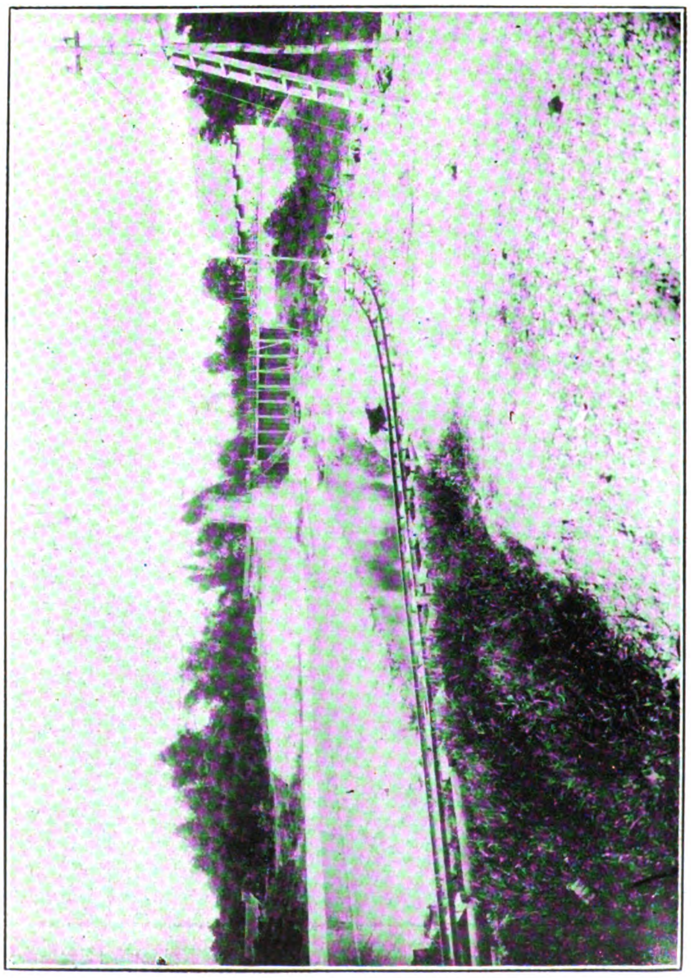
View of South Headworks Showing Uncompleted Dam, July 6, 1924



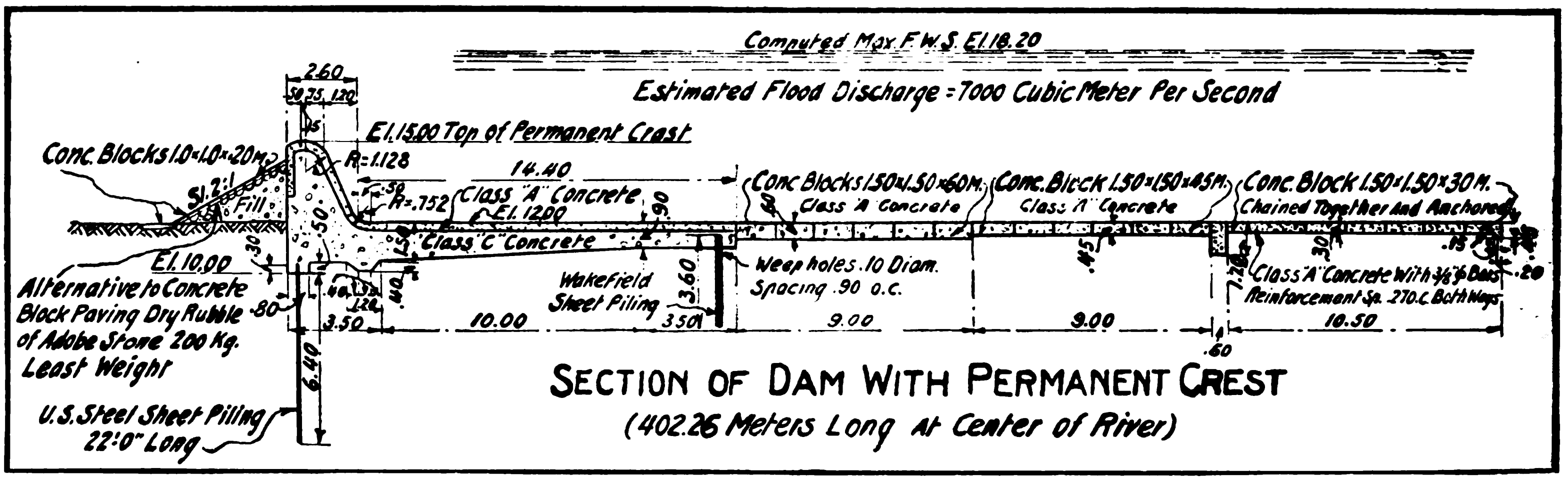
Downstream View of North Headgate Structure, July 6, 1924



North Headworks Showing Gate Hoisting Devices and Operating Bridge for Sluice Gates

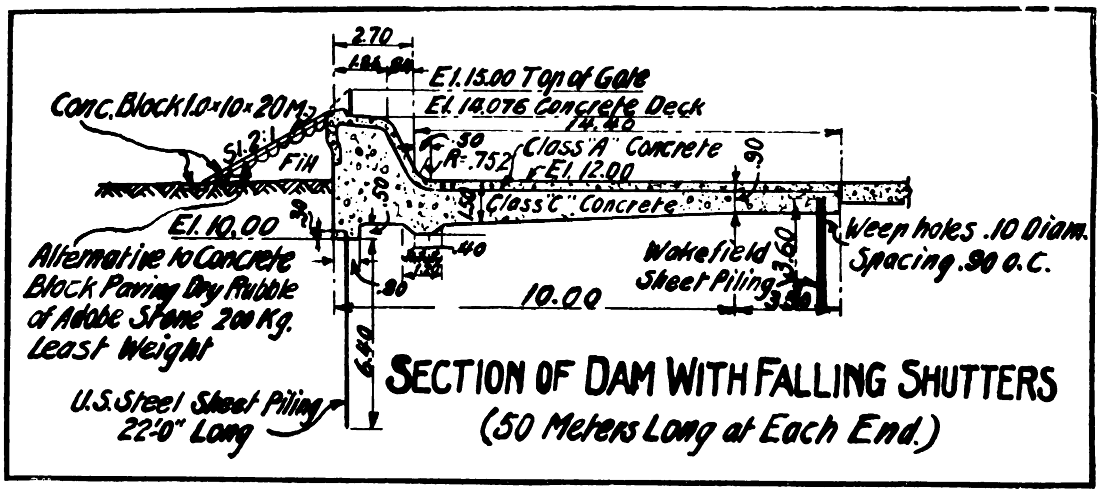


View of North Headworks, Showing Upstream View of Completed Portion of Dam. The Upstream Face of Dam is Protected with Inclined Concrete Block Paving, July 6, 1924



south, and the delivery of water from these main canals through two distribution systems to lands on both sides of the Angat River.

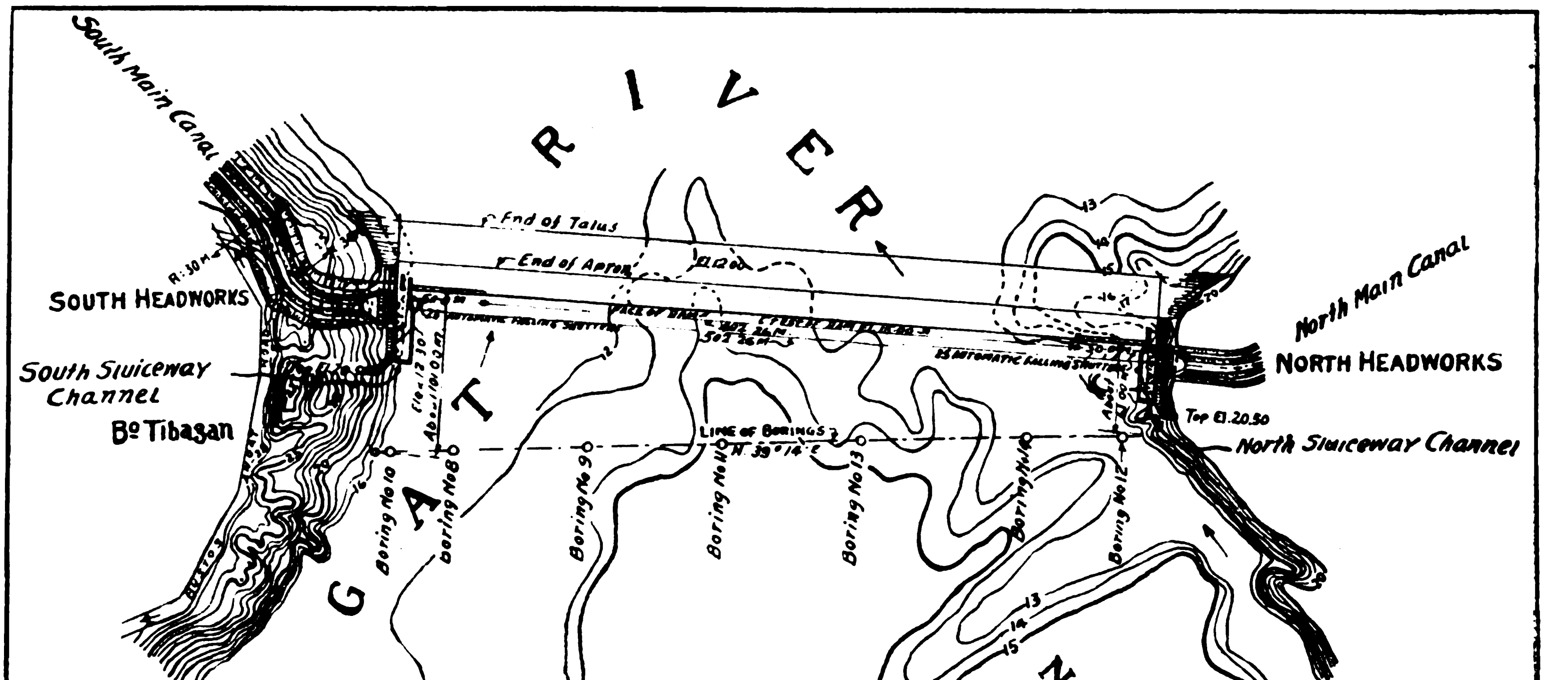
The most important features of this system are the diversion works consisting of a low weir and two head-works, the north and south main canals provided with spillways and settling basins, and the distribution system serving land with a very gentle slope and with numerous road, railroad, and drainage crossings. Reinforced concrete is used in all the structures.



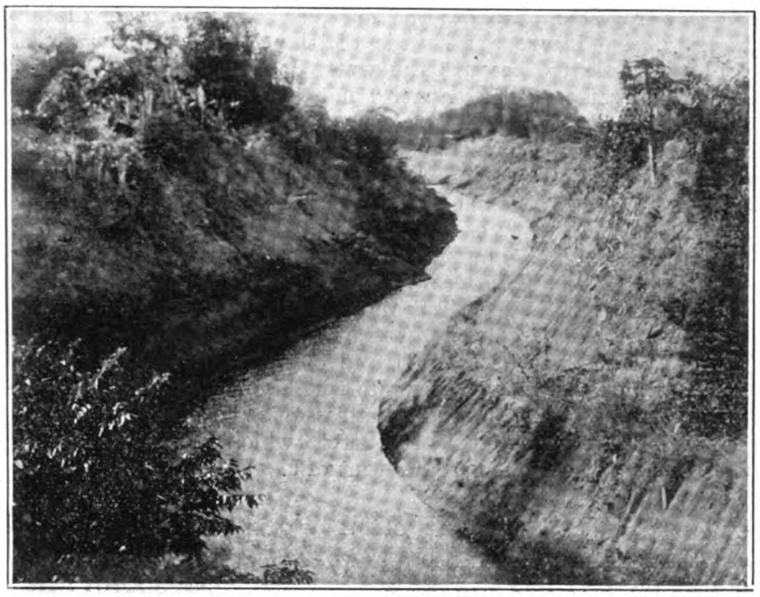
Angat River Irrigation System: Diversion Works, Sections of Dam

Diversion Works

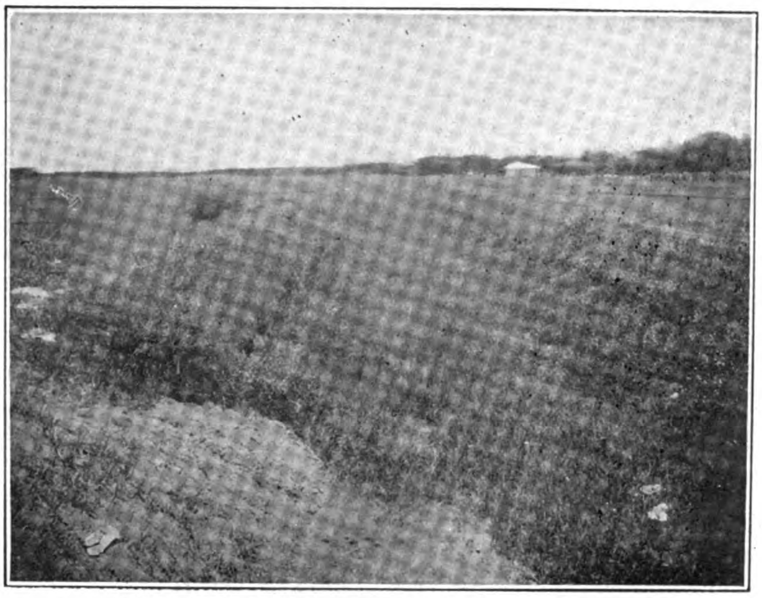
The works consist of a low diversion weir and of the north and south headworks



Angat River Irrigation System: Diversion Works, General Layout



Main Canal, Angat River Irrigation System, Feb. 14, 1924



View of Main South Canal at k.m. 10.37, Carrying Capacity 22,600 Second-liters, July 6, 1924

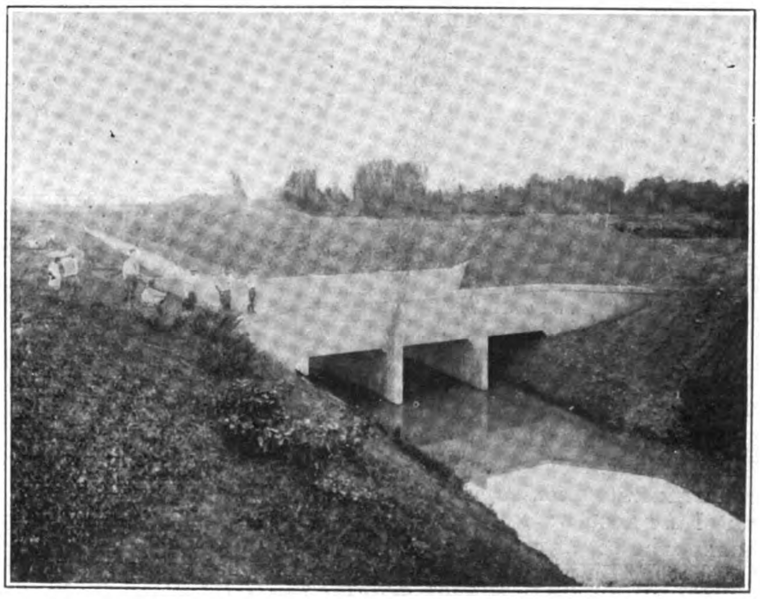
with their appurtenant sluiceway channels. The dam is 502 metres long between the piers of the sluiceway channels and is 3.00 metres high. It is built of class C, 1 : 3: 6 : mix, concrete covered with a wearing surface of class A, 1 : 2: 4 mix, concrete 30 centimetres in thickness, designed to stand the abrasive action of the sand and gravel carried by the floods. The weir rests entirely on sand and gravel foundations, which extend more than 13 metres below the river bed, the depth reached by the borings made. The row of steel sheetpiling 6.7 metres long shown on the heel of the dam and the long rear apron have been specified to lengthen the path of the water percolating beneath the dam, and thus prevent its undermining and decrease the hydrostatic uplift. The general design ofthe weir is similar, with a few modifications, to that in vogue elsewhere but particularly in India. Prominent among the features changed is the talus or paving below the down-stream apron of the dam which is thinner and shorter than that called for by the time-honored practice and the empirical formulas suggested by Mr. Bligh. The length of the lower part of this talus is proportioned in accordance with the depth of the maximum scour of the river determined from observations of its behavior during floods and not in accordance with the flood flow per unit width of crest and the height of the dam. The talus consists of square reinforced concrete blocks, 1.50 by 1.50 metres, decreasing in thickness from 60 to 30 centimetres. The lower 7 blocks linked together and chained to an anchor wall to prevent their separation from the main body of the structure, from a flexible mattress that would adjust itself readily to scour. The length of the flexible portion of the talus is about twice the depth of maximum scour in the river. With this innovation a saving was effected in materials and labor over and above the design based on the standard practice of about 20 per cent, or approximately P.200,000.00.

At each end of the dam there is a section 50 metres long provided with automatic falling shutters, each 90 centimetres high and 2 metres long, which are designed to fall with the rising flood and are intended to prevent the formation of sand and gravel bars in front of both headworks, and also to increase the capacity of the weir for discharging the flood flow. The maximum volume of flood is estimated to be 7,000,000 liters per second from a mountainous drainage area of about 870 square kilometres.

The headworks consist of the main canal headgates, which are designed to regulate the flow of the water entering the system, and of the sluiceway channels intended to remove the sand and gravel from the river waters flowing into the main canals.

A difference in level between the crest of the dam and the south main canal water surface of 30 centimetres, and 25 centimetres between the crest of the dam and the water surface in the north main canal, is provided to force the water through the headgates. There are 12 gates 60 inches wide and 48 inches high on the south headworks and 10 gates of the same size on the north side. The water will, by proper regulation of flashboards, enter both headworks with practically the same velocity as in the main canals.

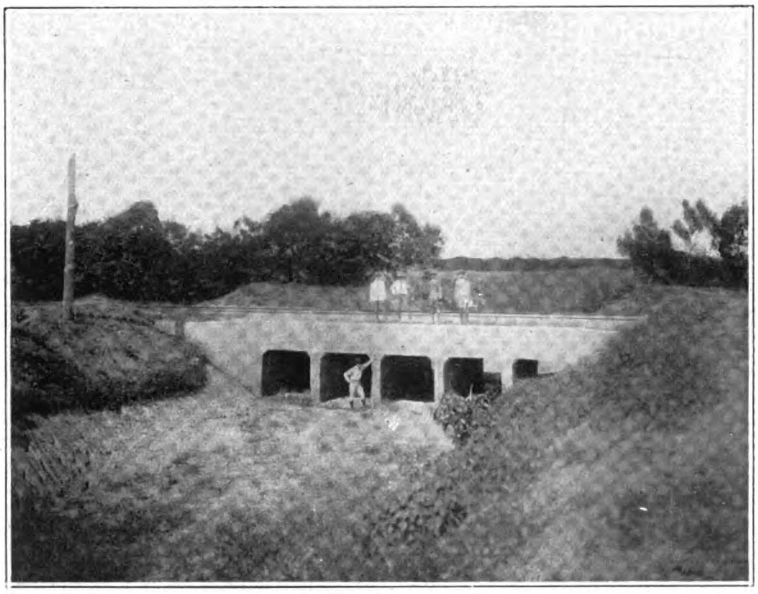
South Protective Dyke near its Upstream End. Connecting South Main Canal Bank at k.m. 9.39, July 6, 1924



Overhead Drainage Crossing over the South Main Canal at k.m. 1.60, July 6, 1924

The south sluiceway channel is 48.33 metres long and 13.50 metres wide. The channel is closed by two sluice gates of the Stoney type 15 feet wide and 10 feet high which are to be operated by hand. The north sluiceway channel is 39.88 metres long and 9.50 metres wide. This channel is closed by a Stoney gate, 20 feet wide and 10 feet high, also to be operated by hand. The bottom of the sluiceway channel is placed 1.20 metres below the sill of the gates in both the north and south headworks to give ample room for the deposition of sand and gravel. When the Stoney gates are closed and the water enters the main canals the velocity of flow in the sluiceway channels is about 60 centimetres per second which is far below the critical velocity. The deposits of sand and gravel accumulated in the sluiceway channels are removed by closing the main canal gates and opening the Stoney gates. The velocity of flow in the sluiceway channel, under these conditions and when carrying its normal capacity, is about 2.4 metres per second which is considered sufficient to scour out all the sand and gravel deposits.

The diversion weir including the sluiceway channels and the main headgate structures involves the excavation of about 70,000 cubic metres of sand and gravel; the placing of 23,340 cubic metres of reinforced concrete which requires over 35,300 barrels of cement and 325 tons of reinforcing steel; and of driving about 11,500 lineal metres of United States Steel Co. sheetpiling and 6,300 metres of Wakefield sheetpiling. The estimated cost of the diversion works is P.1,000,000.



Standard Reinforced Concrete Railroad Culvert on the South Main Canal at k.m. 13.64, July 6, 1924

Distribution System

The distribution system is divided by the Angat River into two units, north and south, which are similar in almost every respect. The main canals follow roughly the river banks from the intake to almost their ends. The banks are the highest lines of the project, the country sloping gently away from them. The south unit is protected from inundations by means of a dyke 16 kilometres long beginning from km. 9.39 of south main canal and ending at the railroad bridge over the Angat River near the town of San Marcos.

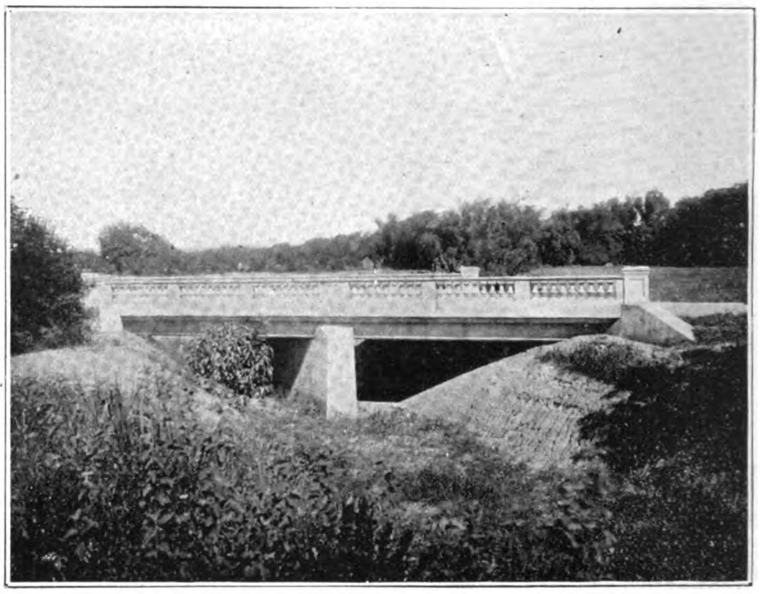
The south main canal is provided at km. 6.2 with an automatic spillway and escape which functions as a safety valve for the excess water entering the main canal, either from the river or from the hillsides, and protects the system in case of a break occurring in the lower sections of the main canal or in the laterals. The north main canal is also provided with spillways and settling basins at kms. 4.3 and 5.5. These spillways and settling basins are intended to take care of the surplus water entering the system, and of the flood waters of creeks utilized as portions of the main canal. The settling basins are designed to retain the sand and gravel carried by the floods of these creeks which are from time to time removed by opening the scouring sluices provided for in the same structures. The other main canal and lateral structures include lateral headgates, turnouts, railroad and highway bridges bull-cart crossings, checkgates, flumes, siphons, and other drainage crossings. To insure a scientific distribution of water provision has been made to measure the water in all turnouts and in all lateral headgates with a capacity not greater than 1,000 second-liters.

The south unit consists of a main canal 31.6 kilometres long and 174.4 kilometres of laterals and sub-laterals. There are 305 structures in all, with the exception of the turnouts which number over 1,000. The work consists of 1,080,000 cubic metres of canal excavation, of 160,000 cubic metres of earth fill for the dyke, and of placing 5,200 cubic metres of reinforced concrete involving the use of 10,400 barrels of cement and 190 tons of reinforcing steel.

The north unit consists of a main canal 22 kilometres long and 115 kilometres of laterals and sub-laterals. There are 205 structures, aside from the turnouts which alone number 660. The work consists of 680,000 cubic metres of canal excavation and of placing 4,800 cubic metres of concrete which involves the use of 9,200 barrels of cement and 160 tons of steel.

Construction Work

The construction plan of this project provided for the division of the work into five different parts, namely: Construction of the diversion works, excavation of the south side canal system, construction of the south side canal structures, excavation of the north side canal system, and construction of the north unit canal structures.



Reinforced Concrete Girder Bridge of two 8 metre Spans on the Mani North Road, near Quinqua over the South Main Canal at k.m. 13.90

This scheme was adopted as funds could not be made available in a lump sum for the greater portion or the whole of the project, and work on each part was started as funds were alloted and final designs prepared. The construction of every feature was advertised for bids in compliance with Philippine laws and the award made to the contractor offering the most advantageous bid to the government, usually to the lowest responsible bidder. Prosecution of public works is done by force account in the Philippines, as a rule, only where reasonable bids are not received or expected.

The construction of this project was started in January, 1921, when the contract for the south main canal and distribution system, now completed, was awarded to the Atlantic Gulf and Pacific Co., of Manila, engineers and contractors. The construction of the diversion works is being carried out by Mr. J. B. Findley, an American engineer and contractor. The contract was signed in April, 1922 and the work will be finished by May, 1925. Unfavorable weather and unusual floods during the dry season of 1923 prevented the earlier completion of this work. The south side canal structures are being built by Mr. Romarico Agcaoili, a Filipino engineer and contractor, under a contract entered into in October, 1923, and are scheduled to be completed before the irrigation season of 1925. The contract for the excavation of canals of the north unit was awarded in January of this year to Mr. Carlos A. Barretto, a Filipino architect and contractor, and the work is expected to be completed early next year. Water will be delivered to all the

lands on the south side unit and a part of the north during the growing season of 1925. The construction of the canal structures on the north side will be advertised for bids before the end of the year. It is expected that these structures will be completed and the whole system officially opened by the end of next year.

The unit cost of excavating ordinary earth, the prevailing material in the main canals and distribution system, dropped from P.0.777 to P.0.42 per cubic metre. The former price was paid the Atlantic Gulf and Pacific Co., for a great portion of the canal excavation of the south side unit, and the latter is roughly the average paid for the canal excavation of the north side unit. The high wages prevailing in 1920 account for the higher contract price, which was considered reasonable at the time. Concrete work in the body of the dam cost about P.24.00 a cubic metre for class C concrete and for class A concrete about P.30.00 per cubic metre, the price of cement having steadily gone down from about P.8.50 to P.6.00 a barrel. About P.0.26 per kilo was paid for steel in place. The price paid for concrete for the south side canal structures varied from P.49.50 to P.61.60 per cubic metre depending upon the size and location of the structure. These prices were and still are considered very favorable to the government. Wages of common labor in the project oscillate between P.0.80 and P.1.20 a day of nine hours.

The surveys, the preparation of plans and the supervision of construction work were done by the irrigation division, bureau of public works, of which Mr. A. D. Williams is the director.

Estimate of Cost and Summary of Data

The following tables are included to show a summary of the main features of work involved and the itemized estimate of cost. The cost of this system was originally estimated to be P.4,500,000, but owing to the fall of prices of labor and materials and to savings effected in the final design of the dam and canal structures, and in the elimination of a tunnel 560 metres long proposed originally below the south headworks, it is believed that the system will be completed at a cost of not more than P.4,100,000, which is P.400,000 below the original estimate. The cost per hectare on the basis of the 22,500 hectares that will be actually irrigated, out of the 25,000 hectares irrigable, is P.200.00, according to the original estimate of cost, or P.182.22 according to the revised estimate.

Angat River Irrigation System Revised Estimate of Cost

Diversion Works ...		P.1,000,000
South Side Unit:		
Excavation of main canal and laterals ...	P.957,000	
Earth embankment for protective dyke ...	65,000	
Main canal and lateral structures ...	350,000	
„ „ „ „ gates ...	47,000	
Right of way ...	132,000	
		1,551,000
North Side Unit:		
Excavation of main canal and laterals ...	291,000	
Main canal and lateral structures ...	330,000	
„ „ „ „ gates ...	33,000	
Right of way ...	90,000	
		744,000
Miscellaneous:		
Expenses of engineering field force ...	330,000	
Additional sub-laterals and contingencies ...	135,000	
Overhead charges of bureau of public works, 9% ...	340,650	
		805,650
Total ...		P.4,098,400
Say ...		P.4,100,000

Summary of Data on Angat River Irrigation System

	Diversion Works	South Side	North Side	Total
Cubic metres of excavation ...	70,000	1,080,000	680,000	1,830,000
South protective levee 16 km. long cubic metres of embankment ...	...	160,000	...	160,000
Length of main canal in kms....	...	31.6	22	53.6
Length of laterals and sub-lats. in kms. ...	...	174.4	115	289.4
Number of structures (turnouts excluded) ...	...	305	205	510
Number of turnouts ...	...	1,000	660	1,660
Cubic metres of concrete—				
Class A ...	4,900	5,200	4,000	14,100
„ B ...	740	...	...	740
„ C ...	17,700	...	800	18,500
Kilos of reinforcing bars ...	325,000	190,000	160,000	675,000
Barrels of cement ...	35,300	10,400	9,200	54,900
Cubic metres of rip-rap paving	...	120	90	310
Cubic metres of concrete block paving...	...	30	20	50
Thousand B. ft. of lumber, ipil	...	1	1	2
Thousand B. ft. of lumber, yacal ...	...	27	18	45
Linear metres of concrete pipe from 12" to 30" in diameter ...	...	1,250	850	2,100
Length of steel sheetpiling in metres ...	11,500	...	...	11,500
Length of Wakefield sheetpiling in metres ...	6,280	...	...	6,280

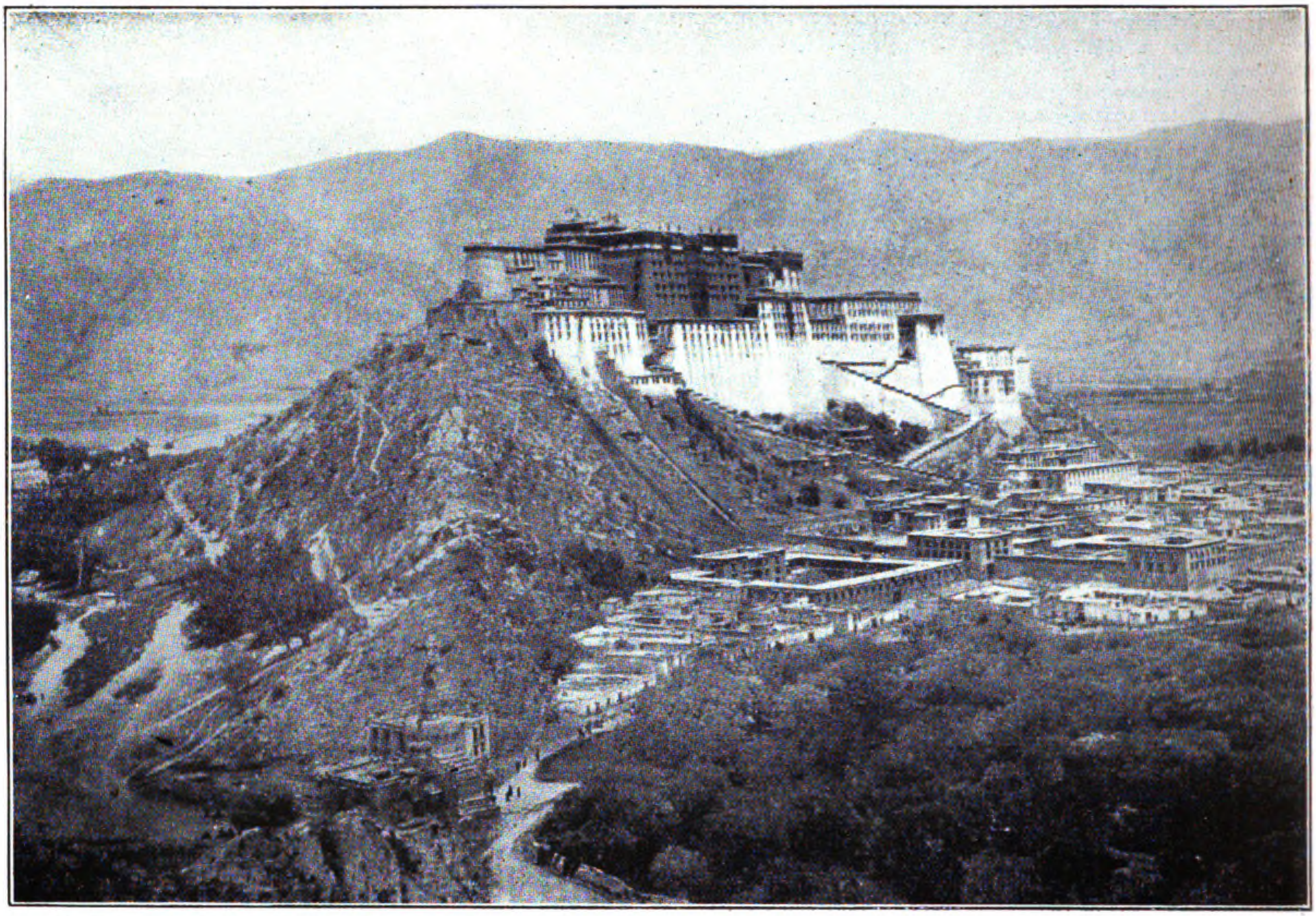
Financing and Control of the System

The entire work is financed by the government but the total cost of construction with interest at 4 per cent., is to be reimbursed by the landowners benefited in 40 equal annual instalments from the date of completion of the system. It should, however, be stated here that the cost of irrigation works approved for construction after March 8, 1922, when the issue of P.20,000,000 worth of bonds was authorized by the Philippine legislature for the construction of irrigation systems, is to be reimbursed by the landowners benefited with 6 per cent., interest in not more than 20 equal annual instalments. These charges are collected like land taxes and are a lien upon the lands included as irrigable under the project. The system will be operated by the director of public works at the expense of the landowners until it is fully paid for, after which the control and management of the system may be turned over to the water users after organizing themselves into an irrigation community in accordance with the provisions of the national irrigation act. The total annual charge, computed on the basis of the original estimate of cost, to be collected from the owners of irrigable lands is P.21.34 per hectare and consists of the following items : Cost of construction charge, P.5.00 ; equal annual interest charge, P5.10 ; estimated yearly cost of operation and maintenance, P.2.00 ; and P.0.24 for insurance, which is 2 per cent. of all the preceding items, to be used for repairs to, or reconstruction of, any portion of the system damaged or destroyed by a fortuitous event or *force majeure*.

Social and Economic Considerations and Prospects

The construction of this system was decided upon only after ascertaining the favorable attitude of the landowners to be benefited. The provincial and municipal officials concerned acting in behalf of their constituents passed resolutions requesting the development of this project. Following the procedure prescribed by the irrigation act, its construction was advertised in the official Gazette and in the local newspapers and notices were published in all the towns affected and read before the people by public criers for one month and no protests were received by the secretary of commerce and communications of the Philippine cabinet during the three months' period, following the advertisement, set for filing such protests. The people are well aware that the construction of the system represents to them a profitable investment as the expected returns are higher than the total annual charge for the cost of construction, interest, operation and maintenance, and insurance. The increase in production is conservatively estimated at P.25.00 per hectare, whereas the total annual charge amounts to only P.12.34 per hectare which is to be collected for forty years. An additional income is expected from raising dry season crops, such as mongo, vegetables, corn, and others which is made possible with irrigation. A second crop of rice is not encouraged as it is not deemed advantageous to the landowners themselves aside from the fact that the water supply is insufficient.

It is estimated that the total rice production on the whole area will increase approximately from 31,000,000 to 44,000,000 kilos, even if the present methods of cultivating the soil, harvesting, and marketing the products should prevail in the future. Steps are being taken, however, to increase the present relatively low yield of irrigated fields to the level of production of the most progressive rice regions by carrying out a vigorous campaign of education and demonstration to improve farm practice and marketing methods.



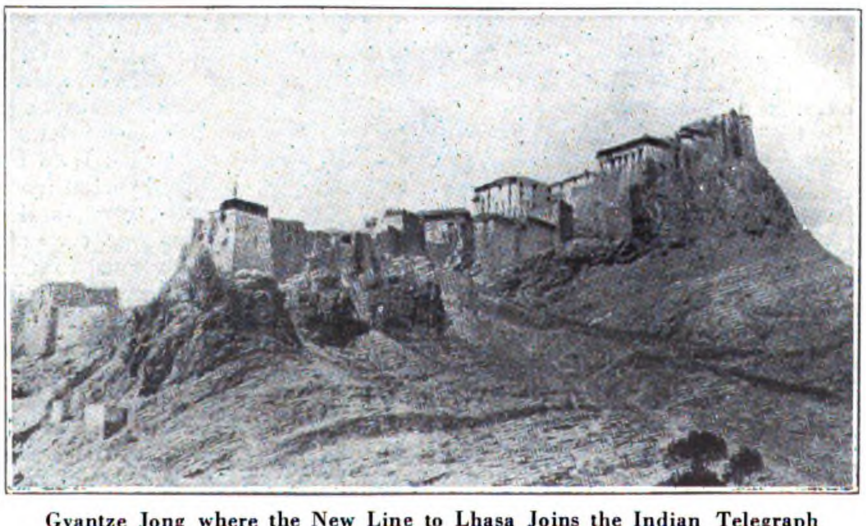
The Potala, Palace of the Dalai Lama in Lhasa, which now has Telephones and soon may glow with Electric Lights. Below this Frowning Stronghold Lies the City of Lhasa Through which the New Telegraph and Telephone Line Now Runs

Hello Central—Give Me Lhasa!

Dalai Lama Instals Telephones in the Potala; Telegraph Finally Invades Thibet to Great Delight of His Holiness' Prime Minister Who Now Plans Hydro-Electric Lighting for Palace and Streets

SHORTLY after the British government, through an agreement signed in 1904 with the Tibetan authorities and confirmed in 1906 by China, secured the right to trade in Gyantze, a Thibet, a telegraph line was built connecting this point with the Indian telegraph service. The construction of this line was provided for in the agreements.

After Thibet become virtually independent, following the driving out of the Chinese troops in 1912, the suggestion was made that the telegraph line should be extended to Lhasa. Nothing was done in this matter until 1921, however. A British engineer, at the request of the Thibetan government, then made a survey. In the following year the construction work on the Gyantze-Lhasa section was begun.

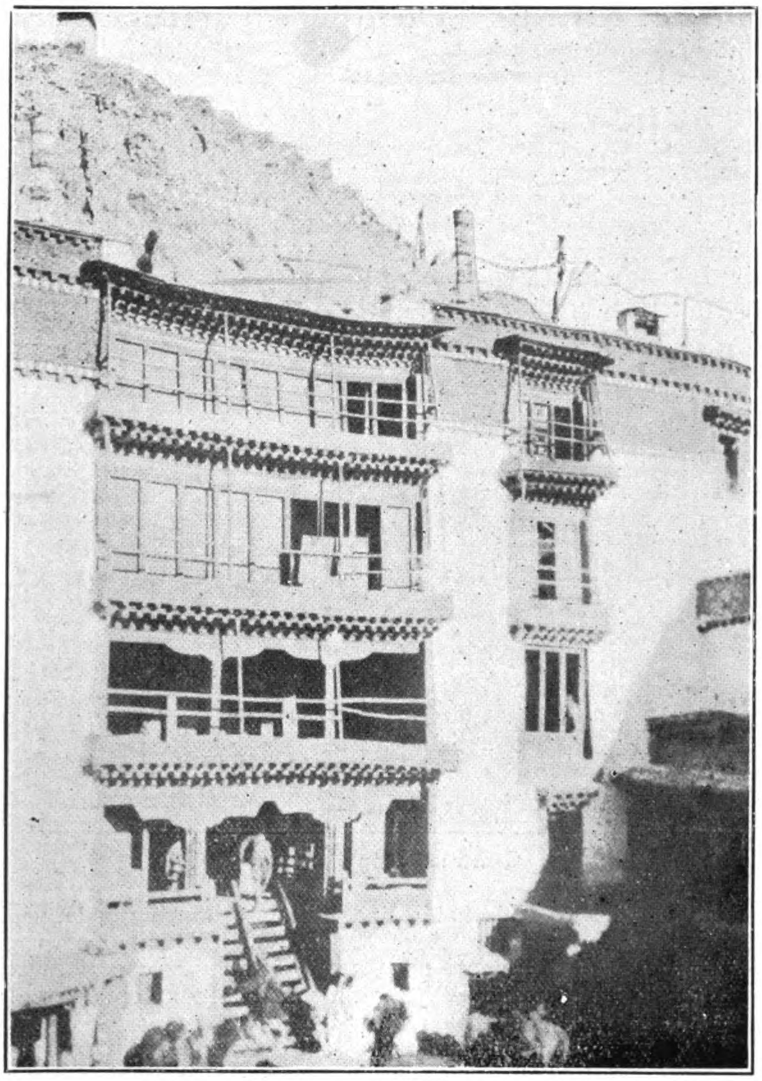


Gyantze Jong where the New Line to Lhasa Joins the Indian Telegraph System

Mr. W. H. King, who was in charge of the construction however, himself gives a full account of his undertaking in an article which appears in the June, 1924, issue of the *Geographical Journal* which is published by the Royal Geographical Society, London.

Mr. King's article in full is as follows:

The idea of extending the line from Gyantze 144 miles to Lhasa was conceived by the Tibetan government. They purchased the wire, brackets, and insulators from us, and supplied their own wooden poles and labor in addition to paying the wages of the twenty-two head coolies recruited by us. The Indian government lent



Home of Thibetan Noble who is Installing Phone Connection with the Potala

them the services of on deputy assistant engineer, a supervisor, and the four linesmen.

The poles of the Lhasa line are of wood of a light type but, their transport was a stupendous task. In many cases they had to be carried by manual labor 60 miles to the site of the line, one village taking them on to the next. I saw teams of six villagers, husband and wife, two sons and two daughters, harnessed to three poles and carrying them along. The Thibetans distributed the material along the line, and I was given a further supply of eighty coolies for the work. All the transport and labor worked gratis for the Thibetan government. The estimate allowed three months for the work, but thanks to the very sensible specification of the material prepared by Mr. J. Fairlay, divisional engineer of telegraphs, after his survey in 1921, the success of Col. Bailey in getting the Thibetan government to realize the need for quick action if they wished to keep within the estimated expenditure, and the splendid arrangements made by the Thibetan authorities, the line was completed in five weeks at an average rate of 4 miles per day. For these arrangements the Thibetan trade agent, a lama of high degree at Gyantze, is primarily responsible. Four Thibetan gentlemen were sent with us for training as linesmen, but as their social status was too high for the class of work, four men of the peasant class were trained instead. Of the four gentlemen two, named Keesoo and Jorkay, were recommended to the Thibetan government for employment as supervisors.

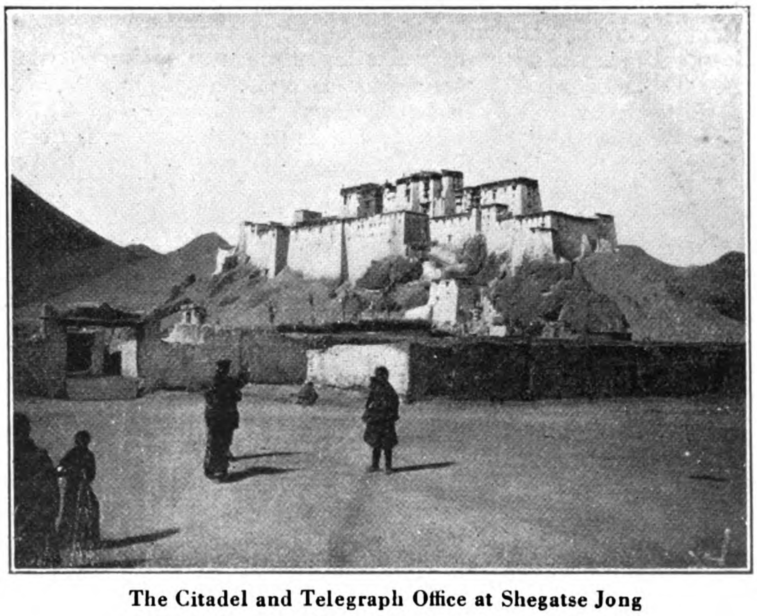
In order to prevent trouble with the Thibetans, to serve as a mentor for Thibetan etiquette and customs, and to act as interpreter, a young Thibetan aristocrat named Kyipook was sent along with us. He is one of the four young Thibetan gentlemen who were sent to Rugby in 1914 for education. On his return he was given a further training in civil engineering in Roorkee engineering college, and than a year's training in telegraphy at Kalimpong. He proved very useful, and, thanks to his genial and kindly nature, everything went off without a single dispute. He has been selected to be the director of the telegraph and telephone in Thibet.

I was told that the Thibetan laborer was slow, stupid, and indolent, but I found him to be the best worker I have yet seen in my experience of labor in many parts of India and East Africa. In lieu of taxation Thibetans perform government work without pay. For the telegraph line, therefore, the labor and transport had to be changed in every district. A large pile of stones on each side of the road marks the end of one and the beginning of another district. Under no pretext will a villager from one district work beyond his boundary. In spite of the privations which hard work under such trying conditions caused, I always found them happy and contented. The Thibetan laborer is quick to grasp what is required to be done, and quick to perform it.

He is very submissive, cheerful, and polite. His position in life is very humble; he must pay very deferential respect to his superiors, and when he approaches any of them take off his cap and hold it in both hands, bow his body forward, and loll his tongue out and remain in that posture until dismissed. He, however, possesses a lease of land, flocks, and herds which yield him and his family ample supplies; so he goes through life with a full stomach, and is perfectly contented.

The completion of the line was looked upon as a great event by the inhabitants of Lhasa, and on the day on which the line was taken through the city the streets were crowded with people. The line was very favorably received all round except by those along whose fields it went, and the reason for this exception is that the owners thought they would be held responsible in case the posts broke. The Lamas gave us a friendly reception throughout, and in one case where the line had to be taken through the grounds of a monastery, the Lamas in occupation were very helpful. When within 3 miles of Lhasa the Thibetan council sent a messenger asking me to avoid the main road for the last 3 miles and to enter Lhasa from across country, the reason assigned being that the Lamas from the two big monasteries of Drepon and Sera pass frequently along the road, and the younger men might be tempted to smash the insulators, just as they used to do with a Chinese line years ago. But the general effect of the line on all classes was one of pride that Thibet had telegraph and telephone lines at last, and that they would no longer be the laughing-stock of Chinese and Japanese merchants and pilgrims.

The Potala and the large Buddhist temple now have telephones in them connecting the offices of the prime minister and council chamber with the Dalai Lama's summer palace. We were allowed to wander freely over these buildings, and given permission to photograph everything except one image in the cathedral. The majority of the shopkeepers are Nepalese, and there are also a few Ladakhi Mohammedans. The latter, I was told, are noted for their sobriety and good behavior. I found them good fellows, but in the habit of putting on prices tremendously. Their leader Khan Saheb Faizulla was very helpful arranging our financial affairs by getting his agent to draw our money in Gyantze and paying us in Lhasa, and also in getting his brethren to sell at reasonable prices.



The Citadel and Telegraph Office at Shegatse Jong

The first telegraph master of Lhasa is Mr. Sonam Tsering, sent on deputation from the Indian department. He is Thibetan by birth but a Christian by religion, educated in Kalimpong and Darjeeling. Except for him the line is worked by Thibetans. Two Lamas are undergoing training in telegraphy in Kalimpongs and on their passing out will relieve the Indian telegraph master. The system will then be managed and worked entirely by the Thibetan government. The telegraph system is used almost entirely by the Nepalese and Ladakhi Mohammedans and a few Thibetan merchants, the majority of Thibetans not having any use for it. But the telephone is very popular with the Thibetans, and whenever opportunity affords the chance of a chat with a friend or relation on the outside they avail themselves of it eagerly, and it is difficult to get them to end the conversation once they start. The post and telegraph system in Thibet is managed by joint postmasters-general, one a Lama and the other a civilian. The postal system is fairly good and letters are regular. They have a system of runners worked on our Indian system, and I have often seen these men running their beat of 5 miles with the short spear and bells of the Indian runner.

The Buddhist priests of Thibet are called Lamas, and it is the invariable custom that at least one male and one female from every family be dedicated to the life of a Lama. The prime minister is an old gentleman of over sixty years of age, of august bearing and charming manners. He is a Thibetan of the old school, and a firm believer in the greatness of Thibet and the goodness of the Buddhist religion, with an unwavering belief in its gods and dragons. It was easy to interest this charming nobleman, as he possessed intelligence of a high order, and had visited India with the Dalai Lama and had seen a good deal of our modern inventions. His courteous manner displayed itself in a delicate style of flattery. When talking about the telegraph line he said, "Your department has erected a monument in Thibet which can be seen for miles and appreciated by all. Thousands of pilgrims will come from China, Japan, Manchuria, and will realize that at last Lhasa possesses telegraphs and telegraphs and telephones, and on their return home will spread the news and the name of the builder all over the East." Talking in this connection, he said that there was a waterfall 4 miles out of Lhasa which offered the means for working a large hydro-electric scheme for lighting Lhasa. At the same time he said a young Thibetan was learning electrical engineering in London and on his return a scheme for lighting Lhasa was to be undertaken. It was his great ambition, he said, that God would spare him long enough to see the streets of Lhasa lighted with electricity.

Tsarong Shape, the commander-in-chief, is the Dalai Lama's favorite councillor and his constant companion. He has a short, tough, wiry figure, and looks every inch a soldier and a leader. He possesses intelligence of a high order and a happy, vivacious disposition. He is very easy to interest, as he loves to listen to military, police, and diplomatic exploits, and takes a keen interest in everything western, and is quick to understand its use, I found his house full of engineering instruments of all descriptions. He is an expert photographer and takes and develops his own plates. His daughter is being educated in a girls' school in Darjeeling.

I came in occasional contact with a few military officers. Their uniforms are entirely British, and all of them cut smart figures in them. Surkong Depon (colonel) is the mint-master of Lhasa, and an enthusiastic progressive like his master the commander-in-chief. The modern Thibetan army is well-trained and smart. They have a fife-and-drum band, bagpipes, and bugles. These can compare with some of the best Indian regiments. It is quite inspiring to see the battalions fix bayonets, present arms to his holiness to the tune of "God Save the King," which the Tibetans have adopted as their national anthem, and march away with gorgeous yellow satin banners flying to the tune of "The girl I left behind me."

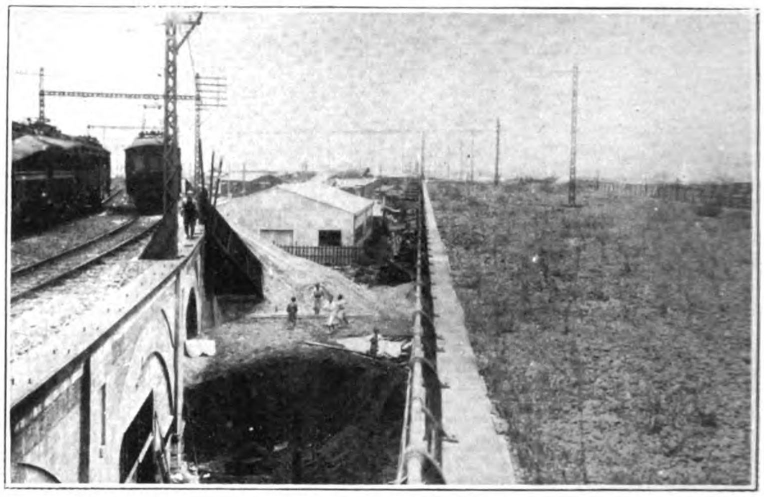
The Dalai Lama took a keen interest in the fixing of his telephone, and pointed out the exact position where he would like it A large battery was needed as the bell was of the battery-ringing type. He sent for his carpenter and ordered a box for the cells from his own design. The carpenter delivered the box ready with partitions in 20 minutes. We had no dry cells and had to prepare a battery by putting perished dry cells into a solution of salammoniac. We had no jars, and his holiness promptly satisfied this want with highly glazed Japanese flowerpots, which he cheerfully sacrificed. To enable him to use one telephone on two circuits at will, I designed a plug-switch which the court blacksmith promptly made up from brass. The plugs needed an insulting handle, and his holiness ordered his Manchurian ivory-carvers to make one of ivory. He was quick to grasp the idea of the switch and to understand how it worked, and he used to watch the preparation of batteries and adjustment of bells with great interest. His holiness's hobby is gardening. His summer palace grounds are laid out on the English system, and are full of flowers and turf lawns. When I bade him farewell, I told him that I would send him the best magnetic telephone on the market, his reply was that I may do so, but that he would like above all was some good flower seeds. I promised to send him some which were obtained from flowers grown in the Kashmir valley, as those would be more suitable to the Lhasa soil. The Dalai Lama talks in a low voice, and most people would think that it would never penetrate a long-distance line, but it surprised me to find that his voice penetrated often when others failed to reach. I listened-in on the line once on my return journey, and I was surprised at the rich timbre of his voice. His personal interest in his own servants was great. When I was leaving Lhasa for India, he asked me if I could take Rs. 20 for him to two Thibetan youths who were learning gardening in the residency at Gangtok, and also to deliver a message to them. He is a keen photographer and takes good photographs.

On my return to Calcutta I was sent back to Rawalpindi and then up the Tochi valley in Waziristan on the north-west frontier for a month. The difference between the two frontiers there is no mistaking, for where I could travel even at night without an escort in Thibet my work in the Tochi was restricted to the hours of 8 a.m. to 3 p.m., after which the road was closed and every one must be within barbed wire or remain out at their own risk. Even in the working hours my party had to be escorted, and we were a continual source of anxiety to the officer commanding signals. Walking to and fro amongst the Waziri travellers on the road during the day is like walking amongst tame lions.

Elevated Line To Link Tokyo Railway Stations

The foundation work of the Japanese government elevated line, which will connect the Kanda station with the Ueno ststion, thereby linking the Tokyo station with that for the northern lines, is now making a good progress. This work will be completed in the spring, and the railway services will be opened in early autumn, next year.

The total distance is only one mile and 35 chains, but when this line is in operation, passengers from Yokohama, Kamakura and all points on the Tokaido line, without changing train, will be able to take trams for Nikko, Sendai and Hokkaido from the Ueno station. At present, all these Tokaido passengers must leave their trains at the Tokyo station and take automobiles or the trams to the Ueno station.



Construction in Progress

The railway line on the left, in the illustration, is the government electric railway system which run around the outskirts of the city of Tokyo. This picture was taken near the Kanda station.

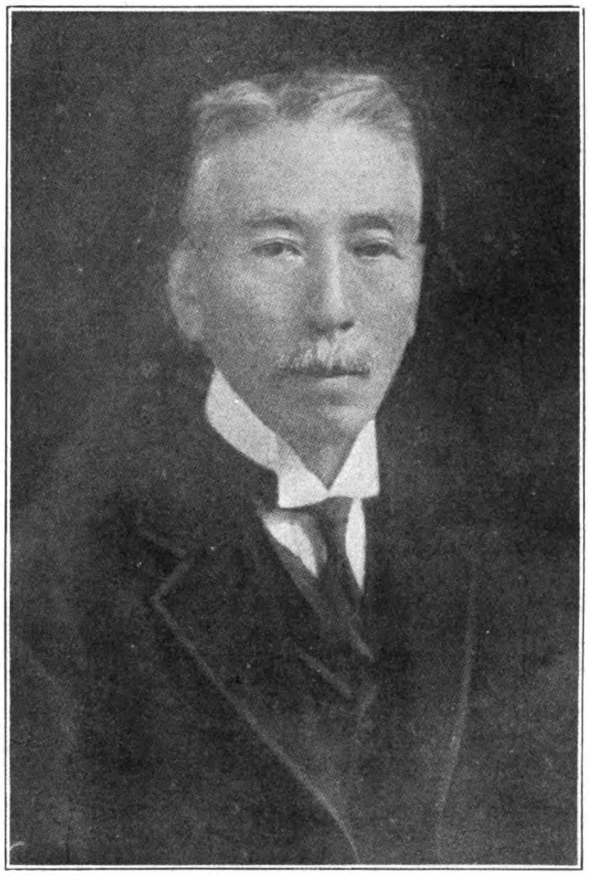
Trade Ties that Bind

United States Has Premier Place in Japan's Foreign Commerce

By Dr. Takuma Dan, Managing Director Mitsui Gomei Kaisha*

ECONOMIC relations between the Japanese and the people of the United States which have been growing with wonderful rapidity, are bringing the two peoples on both sides of the Pacific to be united by a strong bond of sympathy and friendship. As an instance of this we may gratefully recall the fact that the American people were the first to come to our succor in the recent earthquake disaster. How the contribution of funds so liberally and spontaneously made by the sympathetic Americans helped hundreds and thousands of the destitute sufferers need hardly be recounted. While we can hardly estimate with any degree of accuracy the extent of the loss and damage caused by the earthquake and fire, there can be no doubt that the reconstruction work will take many years to come, and absorb many billions of money, but when we remember that the national savings in Japan amount annually to many hundred millions we need hardly apprehend as to the continuation of the reconstruction work on the devastated districts, and rehabilitation of industry.

Under these circumstances, the United States is bound to contniue in supplying a larger part of reconstruction materials. After the bitter experience of the disastrous earthquake, Japan will naturally want iron and steel as building materials which America can abundantly supply. As a matter of fact, American and Japanese steamers are already carrying a bulk of such materials to our shores. Besides these, the United States has also been principal supplier of cotton, machinery, motor vehicles and petroleum to our country. Immediately after the earthquake, the Japanese government issued an imperial ordinance temporarily repealing the import duties on such articles as foodstuffs, clothes and building materials. The value of these imports thus exempted from taxes during the seven months from September, 1923, to March, 1924, amounted to 441 million yen, an increase of 236 million yen on the corresponding period of the preceding years. The increase is due primarily to the reconstruction work, and is largely ascribable to American goods. Apart from the reconstruction work, however, which may naturally be regarded as a temporary factor, the trade between Japan and America has been vastly increasing for the last decade, during which time the Japanese exports to the United States were tripled, and the imports therefrom were quintupled. Of late years the United States, on their part, have made remarkable progress in their Far Eastern trade. Of all the principal countries trading with Japan the United States had stood far below Great Britain, Chinese republic and British India in respect of imports. But they have now secured an unchallengeable place as importers of merchandise into Japan, their goods comprising 25.8 per cent. of the total Japanese imports in 1923; whereas they were only 7.2 per cent. of the imports in 1893 or thirty years before. This, I think, will testify to the possibility of Japan as one of the most prosperous overseas markets of the United States. The following shows the details:



Dr. Takuma Dan

Year	Total Imports	Imports from U.S.A.
1923	Y1,982,231,000	Y551,977,000
1922	1,890,308,000	596,169,000
1921	1,614,155,000	574,401,000
1920	2,336,175,000	873,182,000
1919	2,173,460,000	766,381,000
1918	1,668,144,000	626,026,000
1917	1,035,811,000	359,708,000
1916	756,428,000	204,079,000
1915	532,450,000	102,534,000
1914	595,736,000	96,771,000

To take an example, American lumber was imported in recent years in surprisingly large quantities as follows:

1919	Y 4,020,000
1920	14,910,000
1921	25,318,000
1922	57,246,000
1923	62,492,000

(The July and August imports in Yokohama excluded, the figures being unavailable.)

The above figures indicate the greater part of the total lumber imported to Japan, namely, more than two-thirds.

The increased import was truly due to reconstruction purpose. But there is no denying the fact that American lumber has been enjoying an increasingly wider market in Japan.

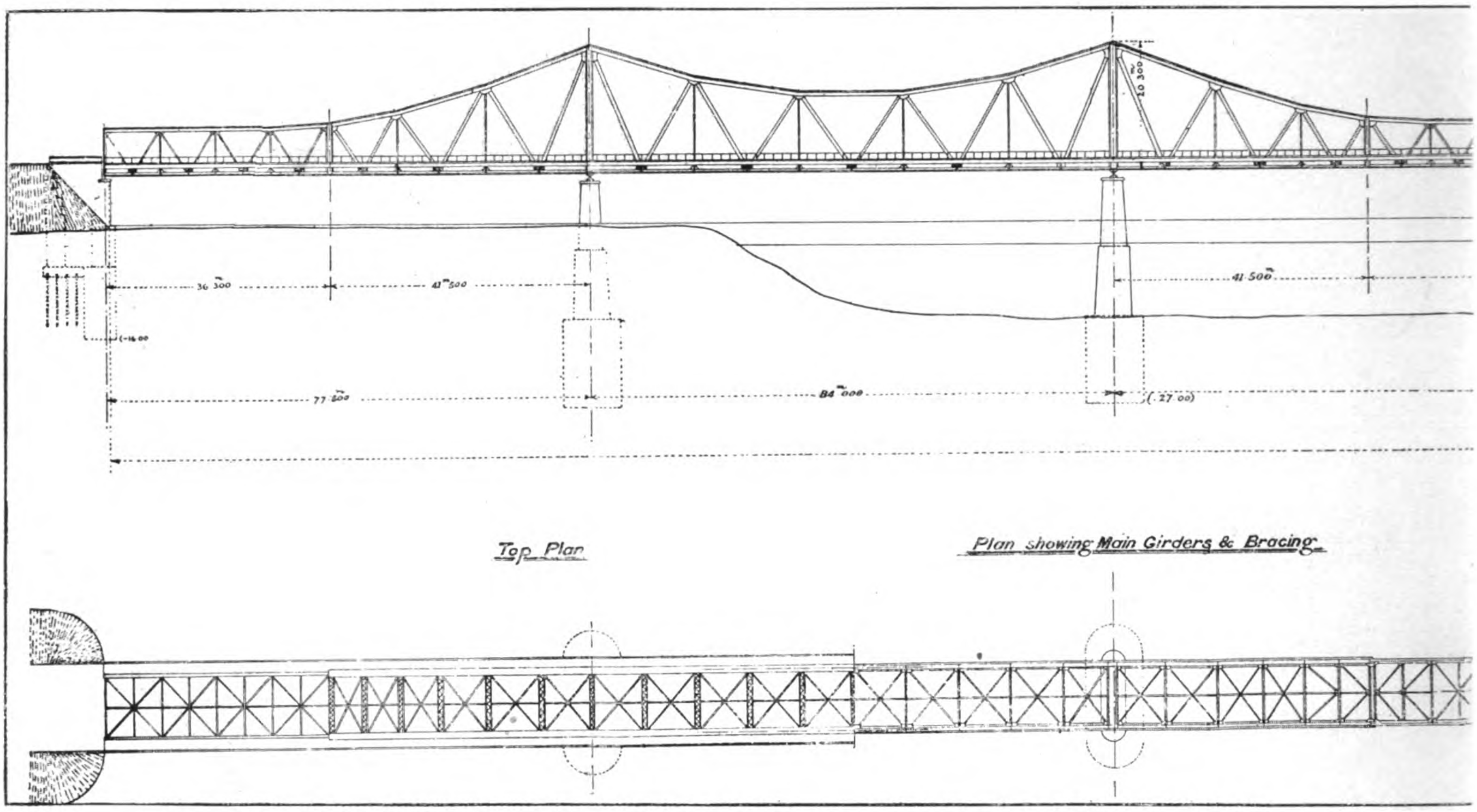
To pay for the imports from the United States (*i.e.*, for cotton, iron and steel, rails, lumber, copper, wheat, flour, petroleum, machinery, motor vehicles, etc.), Japan exports to the United States raw silk, silk goods, tea, camphor and chinaware. The Japanese exports to the United States during the past decades are as follows:

Year	Total Exports	Exports to U.S.A
1923	Y1,447,750,000	Y605,619,000
1922	1,637,452,000	748,500,000
1921	1,252,838,000	496,284,000
1920	1,948,395,000	565,017,000
1919	2,096,873,000	828,098,000
1918	1,962,101,000	530,129,000
1917	1,603,005,000	478,537,000
1916	1,127,468,000	340,245,000
1915	708,306,000	204,141,000
1914	591,101,000	196,539,000

As will be seen from the above tables, the United States hold a

(Continued on page 452).

*What the Standard Oil is in the popular mind to America—a dominating all-powerful far-reaching business organization—the "Mitsui interests," as they are commonly known, are to Japan. The head of this vast organization is Baron Mitsui, but the man to whom it owes much of its tremendous prosperity is Dr. Takuma Dan. He is the managing director of the Mitsui Gomei Kaisha, the holding company for all the varied and widespread Mitsui interests. Dr. Dan was born in 1858 and was sent as a youth to America to study mining engineering at the Boston Institute of Technology, from which he graduated with honors. He was technical officer at the Government Meteorological Observatory and later in charge of the great Miike coal mine. When this was purchased by the Mitsui company he entered the employ of that firm with which he has been associated ever since.



General View of the Rama VI Combined Road and Railway Bridge Over the Menam River at Bangkok: Under Erection

Rama VI. Bridge

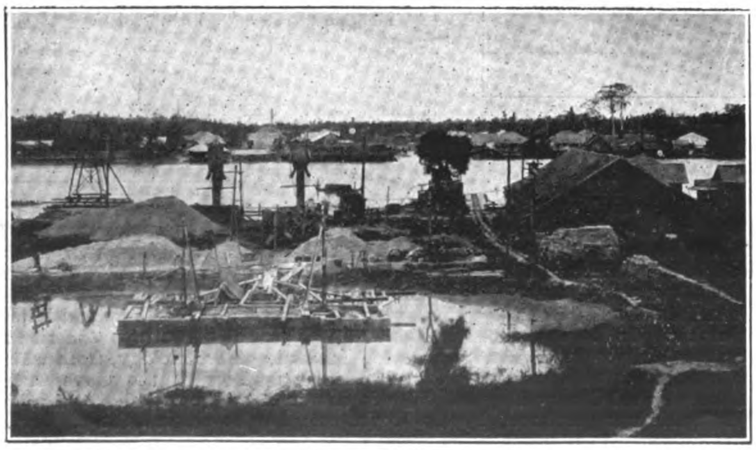
Over the Menam at Bangkok

By Luang Prakob M. Sc. (Birmingham, England)

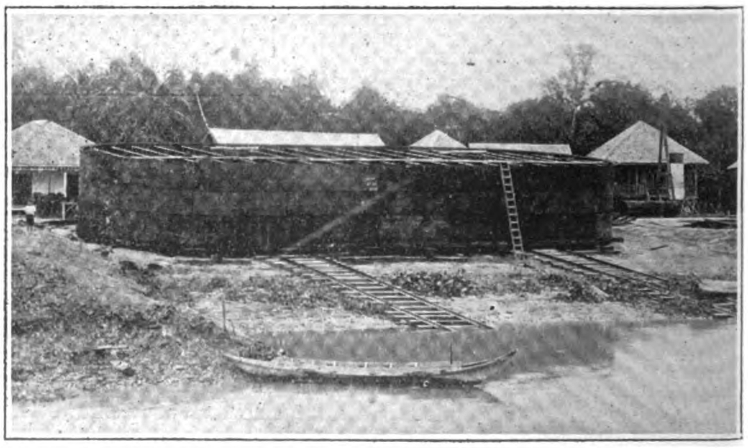
IT was decided in September, 1919 to unify the gauges of the Siam state railways by converting the standard gauge lines from Bangkok to Chiengmai, Korat and Petriew to metre gauge and further to connect up the northern and southern line systems by bridging the Menam Chow Phya. When the bridge and connecting line are completed passengers from the south come direct into Bangkok station, instead of the Bangkok Noi as at present, thus doing away with the difficulty of crossing the river by launch or sampan. Movement oi freight will be much accelerated and rolling stock will be available over the whole system instead of being confined to one side or other of the river as at present. Time and money also will be saved by repairing all locomotives, carriages and wagons at the central workshop in Makasan.

The connecting link, about 13 kms. in length, branches off from the main line to the north at km. 9 just north of Bangsue station and joins the southern line at a point km. 6.336 from Bangkok Noi station. Borings made at the bridge site showed that at a depth of from–14 to –27 M. S. L. good hard clays are found, while below –27 M. S. L. there is a deep layer of sand. The river at the point of crossing is 300 metres wide.

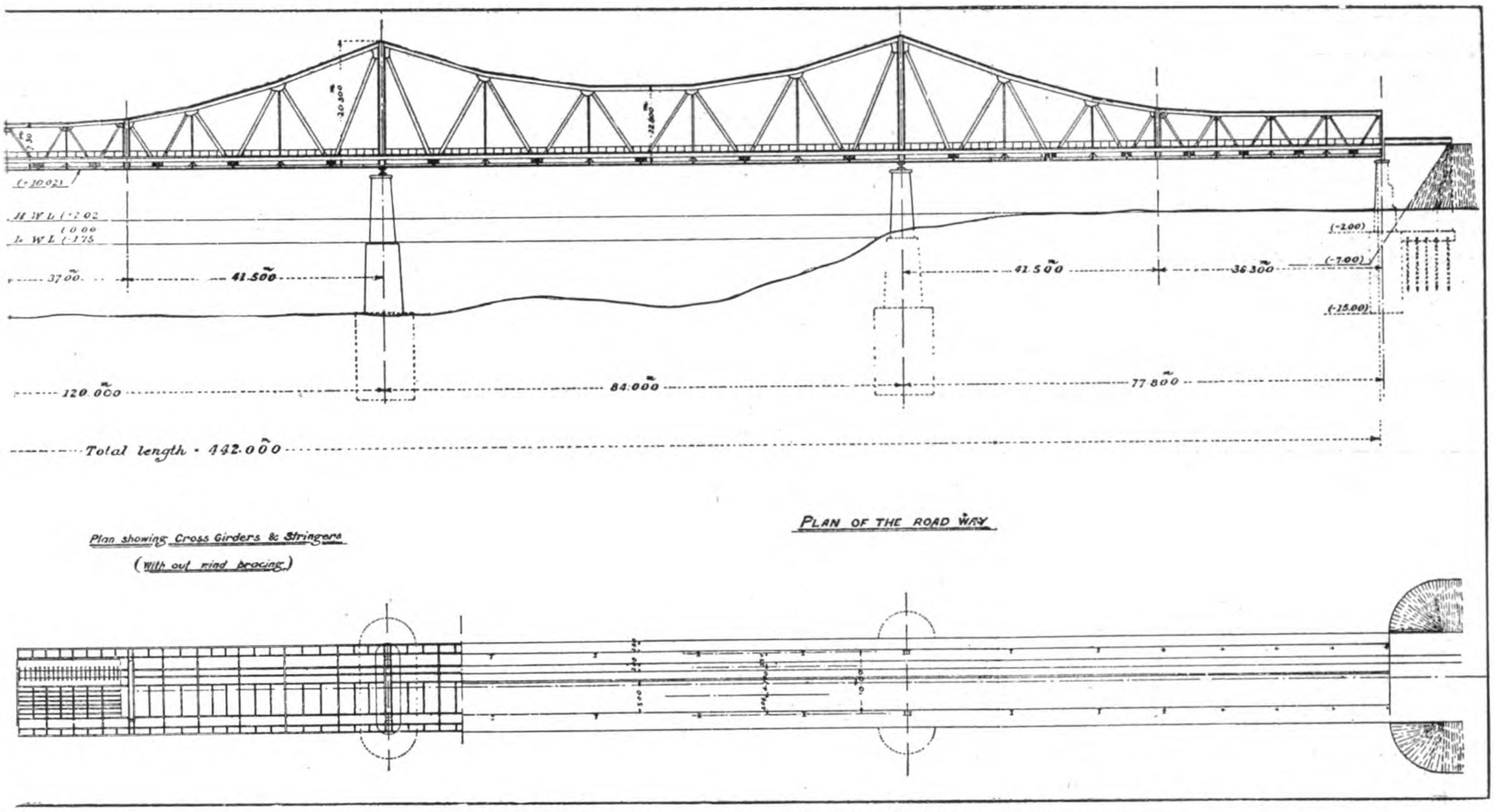
Tenders for the bridge were invited from many well-known firms of contractors and after due consideration the contract was given to Les Etablissements Daydê of Paris. By permission the bridge is called Rama VI after the King of Siam. The bridge is of the cantilever type with a total length between abutments of 442 metres. It is divided into 5 spans the central one being 120 metres while those on either side are 84 metres. The two end spans



General View of Work Showing West Abutment in the Foreground



Bottom Part of Caisson Ready to be Launched



by the Siam State Railways from Plans and Materials by Des Etablissement Dayde of Paris

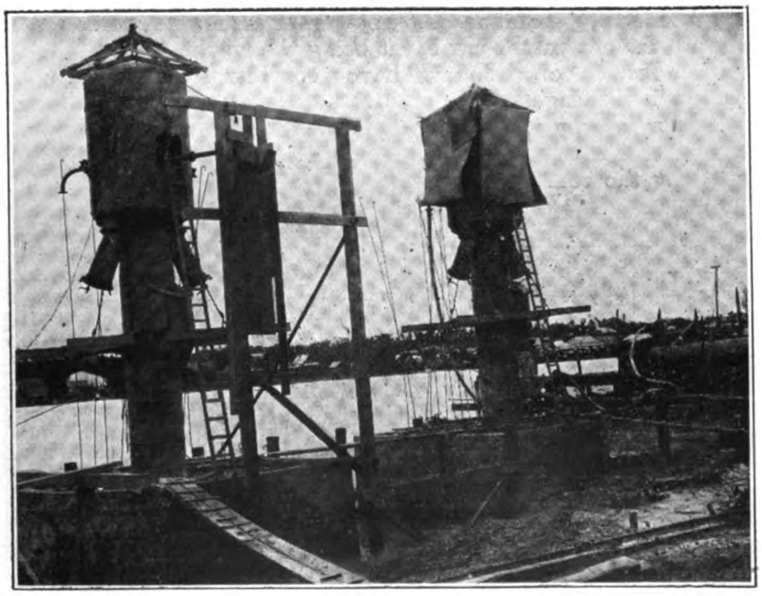
are 77.8 metres. The bridge is 10 metres wide between centres of main girders and consists of a single track railway, a 5 metres roadway and footways 1.50 m. wide on either side, outside the main girders.

The clearance is 10 metres above mean sea level and 8 metres above maximum flood level, so that ordinary launch and cargo boat traffic can pass safety at all times. The expansion and contraction due to changes of temperature are allowed for by three sets of expansion joints on the length of the bridge. The foundations are being carried out under compressed air. The abutments are taken down to a depth of not less than −15 metres and the piers to −27 metres M.S.L. The level of the river bed is about −15 metres M. S. L.

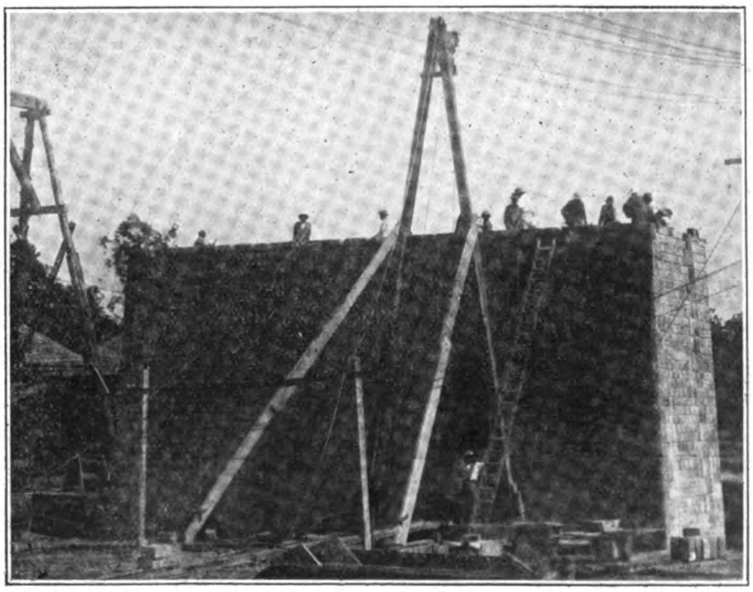
The caissons for the abutments are 16 m. by 6 m. with rounded corners, while the pier caissons are almost twice as large and have semi-circular ends. The calculated pressure on the ground for the abutments (neglecting friction and buoyancy) is 4.5 kgs. per sq. cm. and for the piers 3 kgs. per sq. cm.

Each caisson has two shafts with air locks to provide for disposal of excavated materials and the entrance and exit of workmen. In the case of the east abutment and pier No. 2 the excavated material has been carried up the shafts in steel buckets, but in pier No. 5 water has been introduced into the working chamber to mix with the excavated material which is then blown out through a pipe by compressed air. This method also will be used for the river piers Nos. 3 and 4.

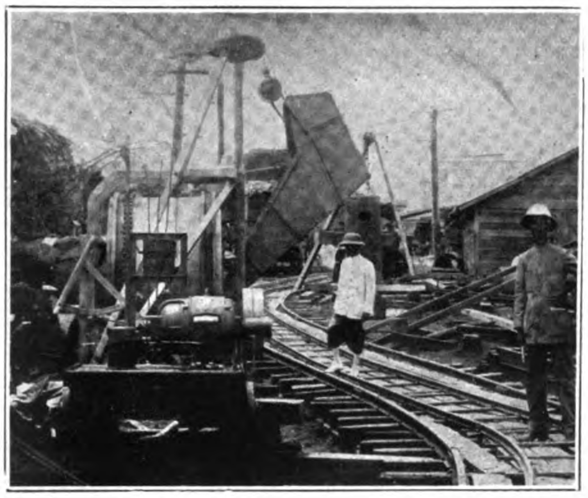
The West abutment has been sunk through the soft blue clay by a compressed air ejector, the caisson sinking by its own weight as the material is removed. Water is pumped in to mix with the clay. In this way the foundation has been taken down 14 metres without the use of air locks but these soon will be required as the materials at that depth becomes more solid and it is necessary to have men in the working chamber to excavate it.



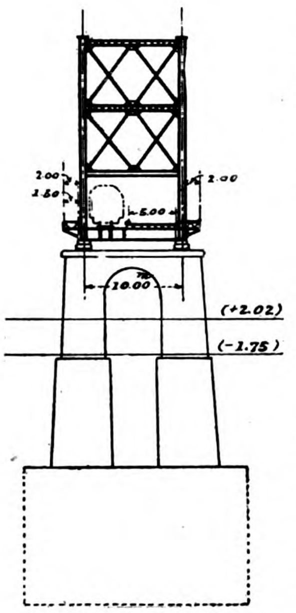
Pier No. 1



Front Elevation of Abutment



All air compressors and other machines are driven by electric power taken from the government power station at Samsen. The current is 3 phase and the voltage 3,000 on the main. As any stoppage of the compressors is a serious matter as it leads to reduction of pressure in the working chamber, two sets of mains were laid, to avert any possibility of a breakdown.



The east abutment now is completed, Pier No. 2 is down to required depth, Pier No. 5 has still to be sunk about 2 metres, and the west abutment is at a depth of 14 metres, ready for construction of air locks.

The working chambers for the river Piers Nos. 3 and 4 are assembled and will be floated into position between two steel barges anchored in the river. Concreting will then be begun on top of the chamber, side plates being added as the caisson sinks. When the river bed is reached the air locks will be erected on the shafts and the excavation proceeded with the material being ejected in the same way as at Pier No. 5. The piers and abutments are faced with specially cast concrete blocks to give the appearance of masonry.

General View on the East Bank

The superstructure contains 2,523 metric tons of mild steel, 63 tons of cast steel and 22 tons of forged steel. The contract sum for the bridge complete in all particulars is Tcs. 2,784,113. Work was begun in December, 1922.

World's Greatest Diesel Engine Power Plant for Shanghai

SHANGHAI will have in operation what is believed to be the greatest Diesel engine power plant in the world as soon the second of two new units now being built in Switzerland is delivered to the Compagnie Francaise de Tramways and installed in the new power-house on Avenue Dubail in the French concession. Two Diesel engines of 1,500 horse-power each already are in operation and the work of erecting the first of the two new machines is nearing completion. This latter engine is of 3,600 horse-power and a similar unit is now being built at the works of Messrs. Sulzer Brothers, Winterthur, Switzerland.

The first two engines aggregating 3,000 brake horse-power were installed in 1921 and 1922, the new station being formally opened on December 8, 1922. It had hardly started before an order was placed with Sulzer Brothers for the first of the two 3,600 horse-power units, and an order for the second soon followed. These two additions to the plant will bring it to a total capacity of 10,200 horse-power, which Mr. O. Meister, manager of the Shanghai branch of Sulzer Brothers, asserts is the largest plant of its kind in the world.

The two engines now operating are coupled to two electric generators of the Oerlikon flywheel type of which a full description was given in THE FAR EASTERN REVIEW for March. The new generators, however, will be furnished by the Creusot works of Messrs. Schneiger & Company of Paris.

The "generator" is a three-phase alternator, producing current at 5,000 volts between phases, with a periodicity of 50 cycles. The normal full-load power of the generator is 3,000 k.v.a.

The alternator is of the flywheel type, rigidly fixed to the main shaft of the Diesel engine and therefore has the same speed as the latter—125 r.p.m.

The field-current is produced by a 110 volt, 60 kw. continuous current exciter acting on the rotor, fixed to the end of the alternator shaft. Alternating current is sent out at the three terminals of the stator.

The new engines are six-cylinder two-cycle machines with cylinders of 760 millimetres bore by 1,020 mm. stroke (20 by 40 inches). They are designed to run at 125 revolutions per minute. According to tests made in the factory, they are very economical in fuel consumption and when running on Borneo crude oil, they will use only 0.42 pounds of oil for each brake horse-power delivered. The scavenging air pumps for these engines are driven from the main crankshaft, while the governor controls not only the fuel feed but the injection air pressure as well as adjusting indirectly the duration of the lift of the fuel valve.

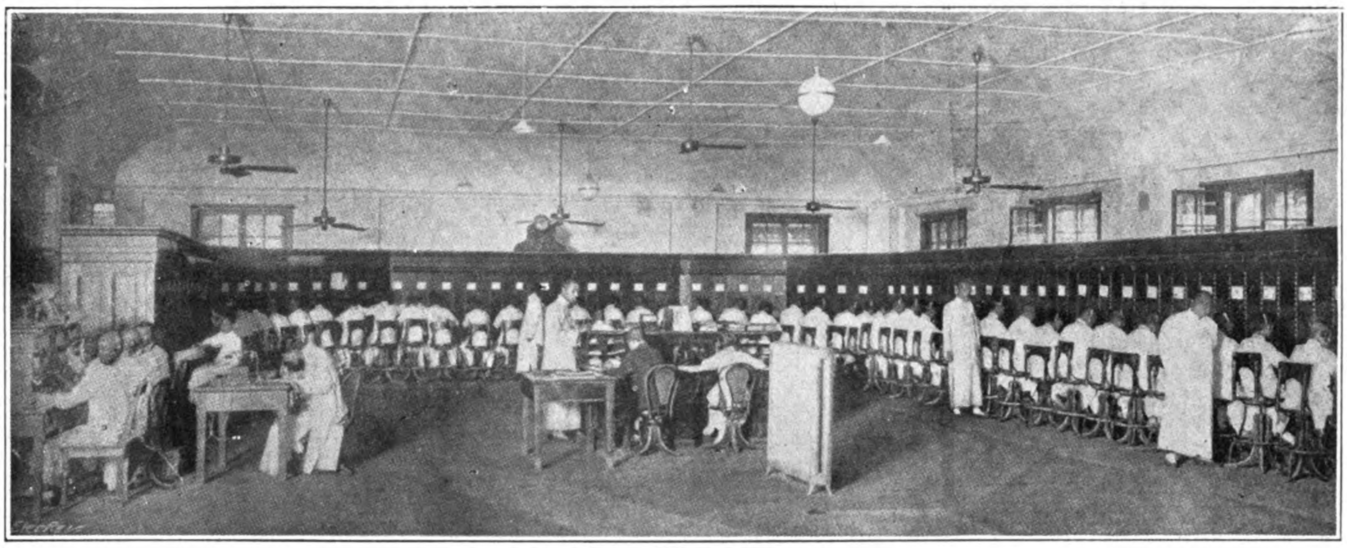
The location of the French Tramways plant practically made Diesel engines imperative owing to the difficulty of obtaining sufficient water for even the present steam plant. This lack of water for condensers put further extensions of the steam installation out of the question and as the steam plant was getting a bit old. It was, therefore, decided by the company's engineers to "build from the ground up," the handsome new power plant on Avenue Dubail opposite the company's car barns being the result.

The French concession will have a considerable excess of power for electric heating and the operation of motors, new rates having been approved by the French municipality for these two uses of current, and many applications for power current have been received by the company.

Electrically Propelled Liner for Pacific

Contracts for the construction of the largest electrically propelled sea-going passenger liner have recently been given the Cramp Shipbuilding Company by the American-Hawaiian Steamship Company, Inc. Turbine-electric drive was selected by the owner in preference to direct Diesel engine or geared turbine.

The turbine-electric propulsion equipment, consisting of two Curtis turbines with a total of 20,000 horse-power will be supplied from water-tube boilers burning oil. The turbines will drive two alternating current generators of 7,700 k.w. each, which will drive two General Electric Company, U.S.A., synchronous motors of 10,000 horse-power, direct connected to the propeller shafts.



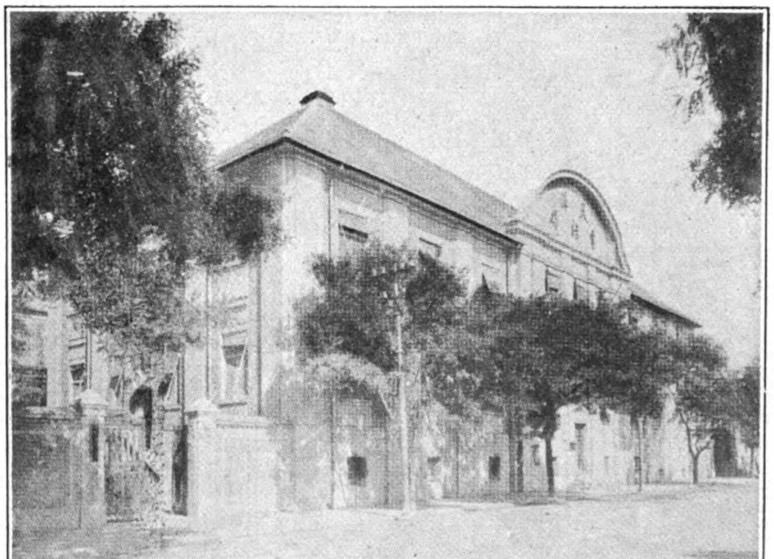
Head Office, Exchange Room

Tientsin's New Telephone Exchange

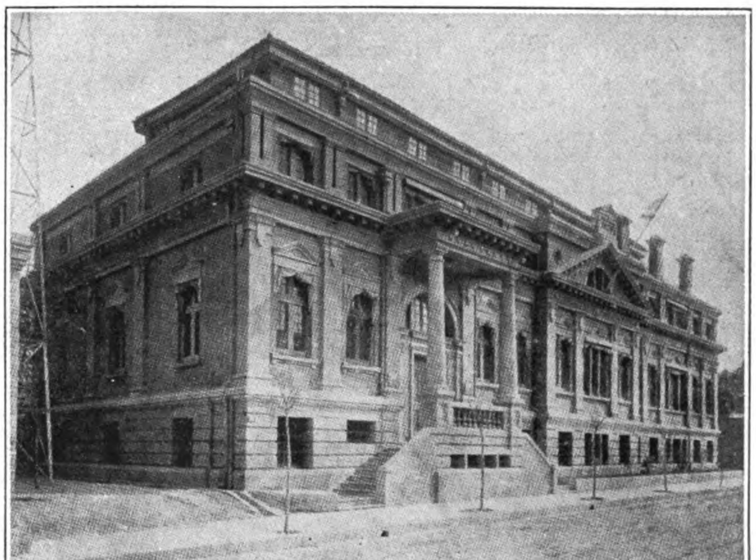
By H. A. Fleet, A.M.I.E.E.

THE city of Tientsin is situated on the banks of the River Hai-ho and the Grand Canal, and may be said to be the most flourishing treaty port in North China, corresponding in importance to Shanghai in the South. It is the natural gateway to Peking, which is distant about 80 miles by rail. The native city and the foreign concessions, or settlements, are located on both sides of the river and cover a total area of over 4,000 acres. In the foreign concessions suitable wharves exist for the accommodation of steamers, for the loading and discharging of cargo, and the several municipalities, British, French, Italian, Japanese, etc., administer their own areas, the native city, which covers about 1,700 acres, being entirely under the jurisdiction of the Chinese.

The telephone system has been in the hands of the Chinese Government Telephone administration since 1913, when the franchise for the concessions, or foreign settlements, was taken over from a private company and the present head office was built and put into operation. It is equipped with Western Electric common-battery manual switch-boards, and has a capacity of 5,200 lines; the subscribers' instruments are of the western Electric and Kellogg types. The main building is about 110-ft. long and 50-ft. wide, the battery room is situated in the basement, and two 1,600-ampere-hours capacity Chloride Electrical Storage Co.'s batteries are installed, the remainder of the basement being used for accommodating repair shops, heating apparatus, etc. On the first floor is the frame room, power room, and office accommodation. A 12-kw. motor-generator set in the power room is supplied from the French tramway power station on the 3-phase system at 380 volts. The exchange room being on the top floor is a lofty and well ventilated chamber fitted with central heating for the comfort of the operators in the winter, and equipped with numerous ceiling fans for cooling, which are very necessary in the summer. The small exchange board on the extreme left communicates with the Peking exchange, and the remainder deal with the local area. The total number of employees in this exchange is about 270, including the switch-board, clerical, and repair staff. One foreign lady supervisor, whose desk is in the centre of the exchange room, is in charge of the operators, who are all Chinese that have been trained by the administration. In the first place they are taken on three months' probation, given living quarters and food, but no wages; during this period they are taught numbers in English and short phrases, such as "number engaged," "no

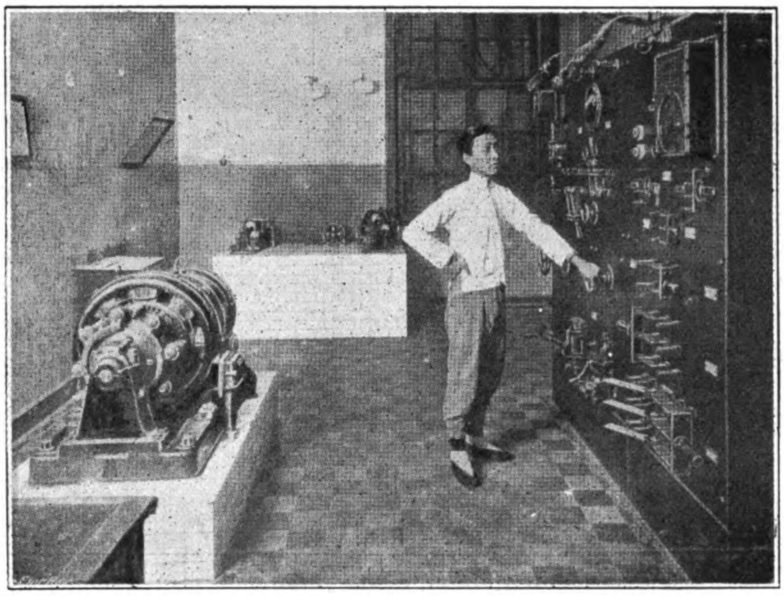


Head Office, Front View

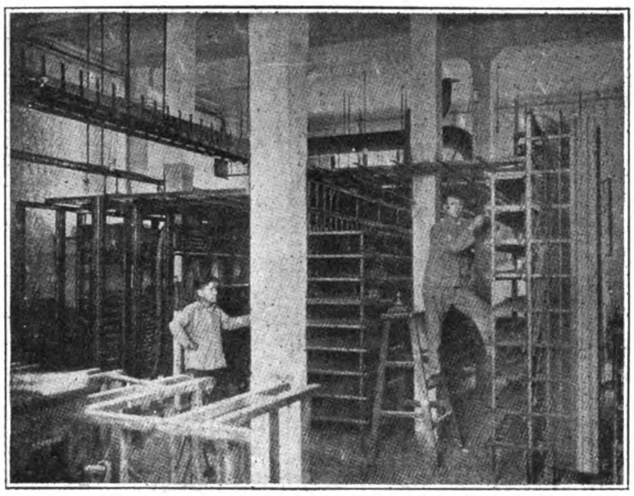


South Office, Showing Base of Radio Tower at Extreme Left

answer," etc. At the end of this time they sit for an examination and, if the results are satisfactory, they are then accepted on the staff, begin to receive a wage of three dollars per month, and are installed as operators ; as they become more proficient, at the end of another six months, the wage is increased to six dollars and there are periodical wage increases according to ability, until a maximum of fifteen dollars is reached. About 1919 the head office exchange, which is situated in the Chinese area, near the borders of the foreign concessions, had reached its limit and a new south office exchange was built, distant about two and a half miles away in the British settlement. This is a handsome brick building about 130-ft. long and 60-ft. wide. It is also equipped with Western Electric common-battery manual switch-boards for 3,000 subscribers and was put into service in 1921. At the west-end corner of the basement 12 cables containing 300 pairs of wires each leave the building, and are laid in ducts, the remaining portion of the basement being used for heating apparatus, etc., and for accommodating some of the staff, of which there are about 130 employed in this exchange. Most of the interior of the building is reinforced concrete ; on the first floor are offices, together with the power and frame rooms which are combined, the door shown on the right leading into the battery room, which contains two Chloride Electrical Storage Co.'s batteries of 2,500 ampere-hours capacity each. The 12-kw. motor-generator set in the power room is supplied from the British municipal council's power station on the 3-phase system at a pressure of 380 volts. In an out-building in the compound there is a suction gas plant developing about 20 b.h.p. and belt-connected to a.d.c. generator for charging the batteries in case of emergency. Adjacent to this building is a radio receiving



Head Office, Power Room



Head Office, Frame Room

ststion that has been recently erected, but it is not being used. Under the present system the head office serves the Chinese city, Japanese, Italian, and ex-Austrian concessions, while the south office serves the British, French, Russian and ex-German concessions. Branch offices serve Tongku and Hsien Shui Ku, while the toll lines to Peking number eight, those to Tongku three, and one serves Hsien Shui Ku. The growth of the system may be noted from the following table :—

TABLE I.

	End of 1913.	End of 1923.
Total number of subscribers	1,890	7,315
Number of conversations per day ..	30,880	135,690

During the past three years the increase in the number of subscribers has grown very rapidly, and it is imperative that immediate steps should be taken to make provision for early extensions. As there is only a limited amount of space available in the south office for about another 2,500 subscribers, it will be necessary to build if the manual system is to be retained and to meet the expansion of the port. Although a large number of different nationalities are served by the telephone system, in order to meet the growing needs of the port, it would be most prudent to install an automatic telephone system.

In China telephone installations are operated either by the Chinese government, the Japanese government or by companies and private concerns. For the extension and improvement of the telephone system a loan was obtained in 1918 from the Sino-Japanese Industrial Corporation on the security of all telephone property, revenue, and the right of operation ; together with six radio stations and treasury notes. The amount of thel oan was Yen 10,000,000, the interest being at the rate of 8 per cent. and the date of maturity three years.—*Electrical Review.*

Injecting Cement to Seal Leaky Dams

THE Swedish Diamond Rock Drilling Co., Ltd. during the last few years has developed a special method for injecting cement in drill holes under high pressure, by means of which several important results can be obtained. The cement slime is injected into the drill hole by a special apparatus, capable of producing a pressure of up to 150 kg. per square centimetre. In practice, the pressures actually used have, however, in most cases been only 30 to 40 kg. to the square centimetre.

The results of this method are that leaky rocks can be made water tight by drilling holes at suitable places and injecting a cement puddle of suitable concentration into the holes. This method finds its application at leaking dams, whereby the dam as well as contact surfaces with solid rock can be tightened. Three objects are attained : The drilling gives information of the geological nature of the rocks ; the tunnel can be blasted in practically water-tight rocks, and the cementation will make the tunnel water tight so that practically no leaks will occur.

Among undertakings of this kind contracted for by the Swedish Diamond Rock Drilling Co. may be mentioned: At Kraftwerk Wäggital in Switzerland, the second largest water power station in Europe, where the gigantic dam is now being tightened by this method at its contacts with the rock. The work comprises more than 4,000 metres of drilling.

In the construction of tunnels under water, for instance in the projected tunnels under the Shimonoseki Strait and under the English Channel, it is of paramount importance that there are no large fissures in the rock. They even might make such tunnels possible of construction. But by means of the method described above, cement can be injected through drill holes in the rock and make it so water tight that hardly pumping from the tunnel either during the construction or afterwards need be done. The practical importance of this is obvious.

The Swedish Diamond Rock Drilling Company who have invented special apparatus for the purpose undertake to carry out any work of this kind. They are represented in the Far East by Messrs. Gadelius & Co., Ltd., of Tokyo, Kobe and Dairen.

The New Shisakajima Submarine Cable

By K. Kawakami and K. Shimizu, Engineers, Sumitomo Electric Wire and Cable Works, Ltd.

IN the autumn of 1922, a submarine power cable thirteen miles in length was laid between the town of Niihama and Shisaka island. This cable is one of the longest of its type that has yet been installed and it is interesting to note that it is entirely of Japanese design and manufacture and was installed by Japanese engineers.

The Shisakajima, or Shisaka island, is located in the Inland Sea, famous for its beautiful scenery, midway between the coast town of Niihama on Shikoku and the coast city of Onomichi on the mainland of Japan. Prior to its lease by the Sumitomo Goshi-Kaisha and the erection there of the company's copper smelter and refinery, Shisakajima was used only as a loading place for fishing boats.

The Sumitomo Goshi-Kaisha has owned from olden times a copper mining concession in the Besshi, some miles inland from Niishama; the ore from this mine being transported to Shisakajima for smelting and refining. In this smelting and refining process, approximately, 1,000 k.w. of electric power is required and prior to the installation of the cable this power was generated on the island by the use of coal. As the hydro-electric development at the Besshi mine provided a surplus of power, which could be generated at a much lower cost than at the coal-burning plant at the smelter, a study was undertaken of the possibility of transmitting this hydro-electric power from the Besshi to Shisakajima.

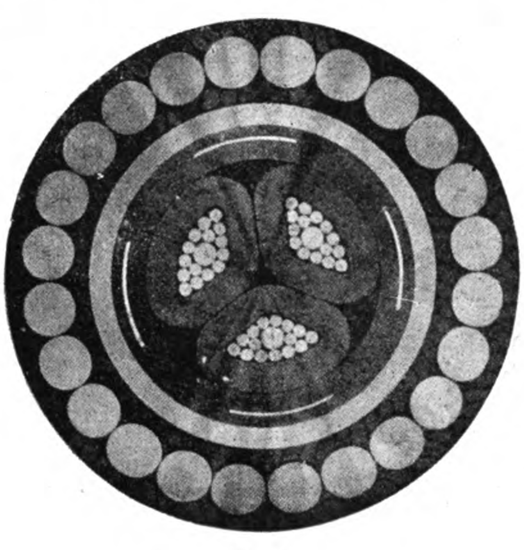


Fig. 1

The questions which confronted the Sumitomo peeopl were, whether power could be transmitted through a submarine cable of this length with full assurance as to continuity of service; if a suitable cable could be manufactured and installed which would have a satisfactory working efficiency; and whether with the depth of water to be encountered—maximum 170 feet—the pressure would be sufficient in the event of puncture for the water to seriously damage a considerable section. After long consideration, it was decided to go ahead with the work and a contract for the cable was placed with the Sumitomo Electric Wire & Cable Works, Ltd., of Osaka, in April, 1922. Manufacture was completed in August, installation begun in October and the final test completed on November 29, 1922. The cable has been in service since this date and has given complete satisfaction.

Power is generated at the Hadeba hydro-electric station at 3,450 volts, 30 cycles. The pressure is then stepped up to 18,165 volts and transmitted by an aerial cable—3 phase, 3 wire system—to the Niihama station, a distance of 6.5 miles; at which point the pressure is reduced to 11,000 volts and transmitted by three aerial cables of No. 0 B&S gauge to the Isoura switch station, located near the shore of Shikoku island. This switch station serves to connect the aerial and submarine cables, a similar arrangement being adopted at the landing on Shisaka island whence power is carried over aerial wires to the plant, the pressure being reduced to 3,300 volts, at which voltage the power is used for service.

The cable is of the 3-core paper insulated, lead covered and galvanized iron wire armored type; a cross-sectional view being shown in Fig. 1. The conductor is composed of annealed copper wires stranded into sector form, insulated with manila paper, three cores laid up circular with wormings of jute yarn and further insulated with manila paper. The core is further wrapped with thin strips of copper laid side by side with proper clearance between and further insulated with manila paper. The core is dried under vacuum, impregnated, lead covered, jute served and armored with galvanized iron wires and finally served overall with jute yarn.

The peculiar feature of the construction of the cable is that under the lead sheath there are four strips of copper wound spirally around the cable core. These copper strips, in addition to serving as a protective device for the cable, are utilized to form two telephone circuits; an application which in so far as we know has not previously been made. The ordinary method of inserting telephone circuits in a power cable is to lay up the insulated pairs with the three insulated power conductors, which makes the diameter of the cable unduly large, particularly so with the sector shaped conductors. Furthermore, the insulation on the telephone conductors must be comparatively heavy so as to avoid breakdown of the insulation, and this also makes the diameter of the cable greater. The present type of cable is far more economical, easier to handle and is less liable to damage during transportation and laying.

In the case of a paper insulated submarine power cable, the use of protective copper strips is almost imperative. If the cable is damaged, the seawater will penetrate into the insulation very quickly and it will take a longer time to repair the cable than in the case of the ordinary underground cable. Cable faults, especially a fault between the lead sheath and insulation, must be detected before the cable breaks down to the water reaches the conductors. This can be done with the present scheme; the copper strips also being used to advantage for purposes of detecting any fault in lead sheath or joints during the process of laying the cable. Fig. 2 shows the method of connection of the copper tapes to the signalling and testing equipment at the two switch stations. The action of the copper tapes as a protective device is such that, when a fault occurs in the cable, the copper tape is earthed at that point and the circuit which the copper forms is closed, causing the current to flow through "B" and "L" and give an alarm.

The cable was manufactured in continuous lengths of 3,000

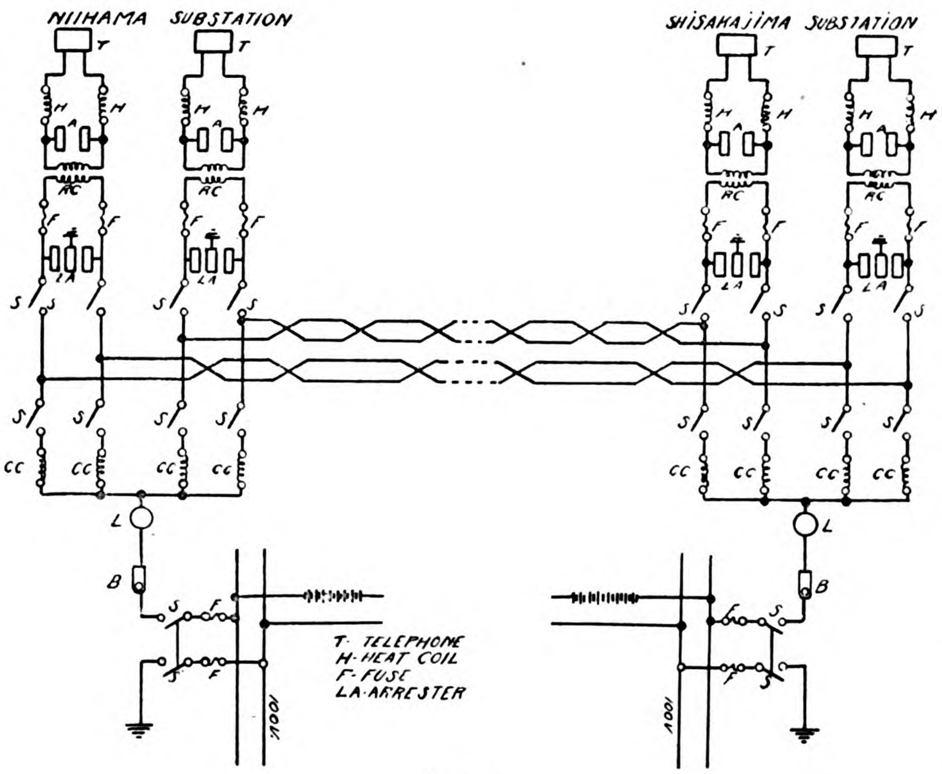


Figure 2

feet at the factory and all of the pieces joined together into two lots before shipment, one section measuring 33,000 feet long and the other 36,000 feet. One section was laid from the beach of Niihama in the direction of Shisakajima and the other from Shisakajima towards Niihama, the joining of these two sections being made at the middle of the sea. In joining, the copper conductors from each end were first connected, then each conductor was lapped with impregnated paper, all were enclosed in a lead sleeve and the joint was filled with insulating compound. Jute was placed over the sleeve and the wire armor was lapped overall to make the joints mechanically strong.

The following physical and electrical properties of the cable as detailed in *Electrical Communication* are of interest :—

Sectional area of each conductor	100,000 circ. mils.
Construction of conductor	19/.0725″
Thickness of insulation between conductors	.350″
Thickness of lead sheath	.130″
Thickness of jute bedding	.100″
Number and diameter of galvanized iron wires	24 x .300″
Thickness of jute serving	.100″
Size of copper tape	½″ x .013″
Approximate overall diameter	3.0″
Weight per 1,000 feet	6.3 tons
Normal working voltage	11,000 volts
(Neutral point of system earthed)	
Factory test each 3,000-ft. length	
Between conductors	33,000 volts a.c.—15 minutes
Between conductors and lead sheath,	28,000 volts a.c.—15 minutes
Tests after installation	
Between conductors	16,500 volts a.c.—10 minutes
Between conductors and lead sheath,	13,500 volts a.c.—10 minutes
Measurements at 72° F.	
Insulation resistance, between one core and other two cores connected to sheath	6.9 megohms
Copper tapes and lead sheath	1.8 megohms
Capacity, between the core and other two cores connected to sheath	4.4 mfd.
Between three cores and sheath	7.9 mfd.
Between tapes and sheath	11.0 mfd.
Between two copper tapes	5.5 mfd.
Copper resistance main conductor	7.65 ohms

Trade Ties that Bind

(Continued from page 445)

premier place in the foreign trade of Japan, their portion comprising about 40 per cent. of the total exports and nearly 30 per cent. of the total imports and far surpassing the other countries, while she comes next to Great Britain, Canada, Germany and France as buyers of their goods.

The future of the trade between America and Japan undoubtedly depends upon the prosperity and friendly relations of the two countries. Fortunately for Japan, the effects of the recent earthquake disaster upon her industrial development have not been so ruinous as was imagined.

Anybody who knows the history of the growth of recent relations between the two countries will agree that the traditional amity has inspired the people of both countries for mutual comprehension and confidence which contributed to the steady and rapid development of trade relations between the United States and Japan.

It is my firm conviction that every man of both countries, one and all, should feel it his own bounden duty to uphold and strengthen the traditional friendship which has been such a potent factor in the past, and which should be made the foundation of a healthy social and business relationship between the two countries, guaranteeing peace on the Pacific and creating a new and brighter dawn of civilization.

A Railway to Szechuan

OCCASIONALLY, although the possibility of such a thing was once scoffingly questioned, a good thing does come out of Nazareth. Marshal Wu Pei-fu is urging the government to proceed with the construction of a railway to Szechuan. Whoever urges this proposal on the government ought to receive the strongest backing from every quarter. There are two principal projects for a line into Szechuan, and it really does not matter much which of the two lines is first built so long as work is actually begun. The senior project is that provided for in the Hukwang loan, on which a good deal of preliminary work has been done under American auspices. This line is to break off from the Peking-Hankow line a little way north of Hankow. The second project is for a line linking up the Lung-Hai line with Szechuan, for which a good deal of preliminary work has been done by the engineers of the Siems-Carey syndicate. Both projects involve considerable engineering difficulties, and the expenditure of very large sums of money, mostly, it may be said, for work and materials and land in China itself, so that an immediate economic benefit would accrue to the people of China from the prosecution of the work, quite apart from the permanent addition to the economic resources of the country when the projects shall have been completed. Obviously, here is an immediate and tangible benefit to be obtained, and no opportunity should be missed of obtaining it. Both projects are American, or at least are allocated to American interests, one of which is outside the scope of the original consortium and has little or nothing to gain by inclusion in the consortium's orbit.

It has been quite obvious for a long time that the consortium is as dead as Queen Anne or Marly, and is only awaiting burial, decent or unceremonious, as occasion may serve. It is possible that a decision to go on with either of these two projects would pave the way for an arrangement whereby urgent railway requirements might be allocated to the different members of the consortium independently of their consortium affiliations and understandings, and thus a new era in railway construction in this country would be inaugurated. Two things stand in the way of such a revival of railway construction. First, the existence of ante-bellum contracts which have gone no further than the documentary stage, and cannot be held valid now that the money markets of the world have undergone a revolution that makes former figures of capitalization, former rates of interest, and indeed every aspect of large-scale finance, lose all their significance. In the second place, parliament will stand in the way of any proceedings that would strengthen the position of the consortium.

It is, as we are constantly repeating, necessary to recognize the facts, which are as we have stated. Then why not act in accordance with the facts. A cabinet committee, consisting of the minister of communications, Admiral Wu Yu-lin, the minister of agriculture and commerce, Dr. W. W. Yen, and the minister of foreign affairs, Dr. Wellington Koo, should be appointed to draft a trunk railways bill in conjunction with a parliamentary Committee, and in conference with foreign financial interests, on the same lines as are frequently adopted in the chaotic countries of Europe as a means towards financial rehabilitation. This committee, in constant touch with the representatives of foreign finance, might draft a scheme as a substitute for the consortium's cast-iron and unworkable model. The consortium interests have frequently intimated that if there is a real alternative they are prepared to consider it. It would be the duty of the proposed committee to show that there is an alternative, and a real alternative, that would be attractive to the foreign investor and would not involve the monopolistic, or apparently monopolistic, features of the consortium plan. We do not for a moment doubt that capital is available or China if China can show that she really means business on practical lines such as would harmonize the various elements that have hitherto been the source of discord and jarring.—*Far Eastern Times.*

Aeroplane View of Villages in the Inundated District

Chinese Conservancy Work on the Yung Ting Ho

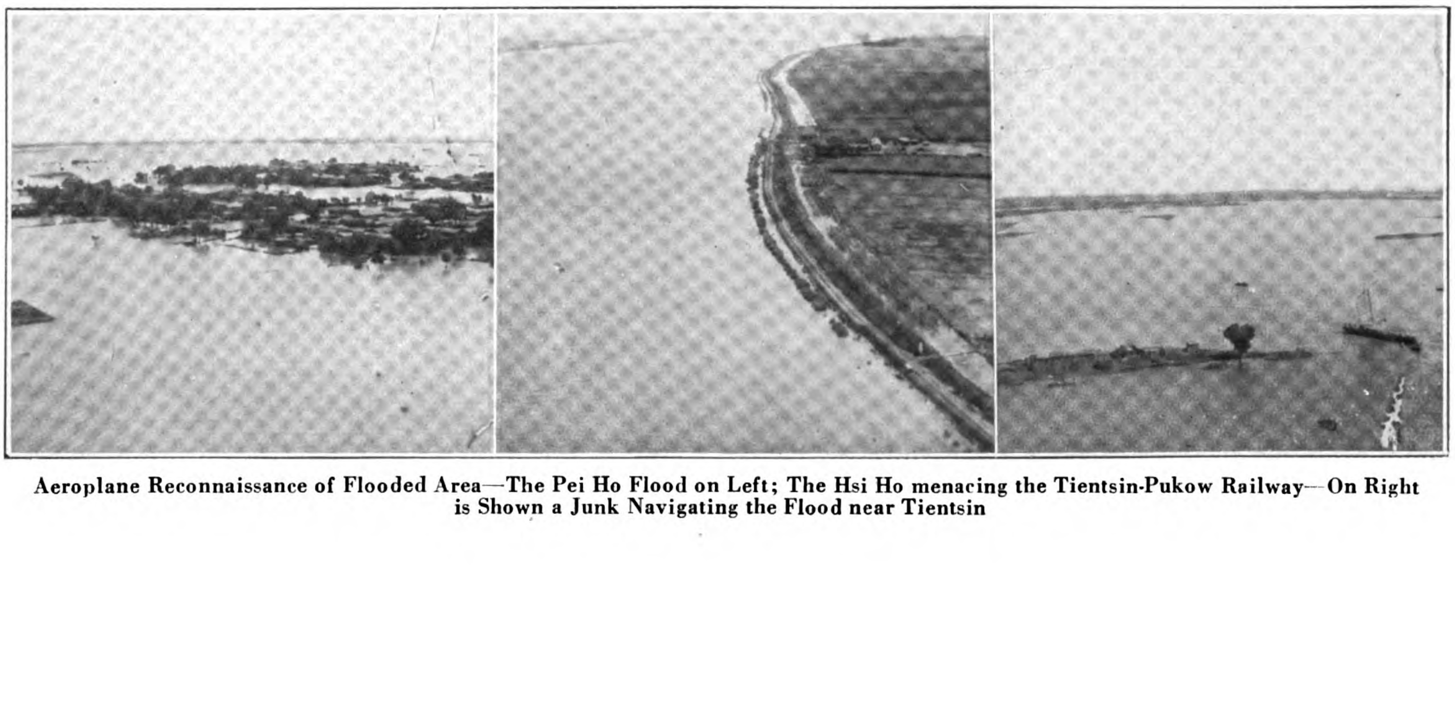
A Plea for Conservancy that Conserves

By Lawrence Impey

PUBLIC attention has recently been drawn to conservancy work in North China by the threat occasioned to the city of Tientsin through the exceptionally heavy floods of the 1924 rainy season, which not only endangered Tientsin itself but also caused many deaths and heavy financial loss not only to the farmers, but to the community at large by reason of the hindrance to or prevention of railway traffic on the various lines in the neighborhood of that city and Peking. The damage and obstruction on the Peking-Suiyuan railway, the temporary cessation of through traffic on the Peking-Hankow railway are instances of this which will be fresh in the minds of all, but for some reason or other very little seems to have been published as to the actual conditions governing and in part responsible for these disastrous floods. The Chihli river commission is of course well known to the public by name, though its functions are probably not so clearly held in mind, but few know much about the Yung Ting conservancy board or have more than a faint idea of the course of that river though it is, in its flood season, the chief menace to the safety of both Peking and Tientsin.

Two years ago the writer had occasion to visit this river and observe the functioning of its conservancy board, acting as inspecting engineer on behalf of the China international famine relief commission, and it has fallen to his lot to repeat the visit this year immediately after the subsidence of maximum flood, so that he has been enabled to obtain some measure of comparison as to the conditions during that period and to estimate in a rough way what the conservancy board actually has accomplished. It must first be pointed out that although one tributary of the Yung Ting River actually rises back in the hills in distant Shansi and the other to the west of Kalgan, no attempt has been made to survey these or prepare any extensive scheme for afforestation of the same by the conservancy authorities referred to. The course of the river in reality first enters the region of practical politics (in more senses than one) when it leaves the western hills in the neighborhood of Mentoukou and takes a turn towards the south on its course to the sea below Tientsin.

The first work that the observer will notice after leaving Mentoukou and proceeding along the river dykes is the embankment work which was carried out in the summer of 1923 by the soldiers of General Feng Yu-hsiang, and which was chiefly financed by the China international famine relief commission. Reference to the accompanying map will show that at the site of the

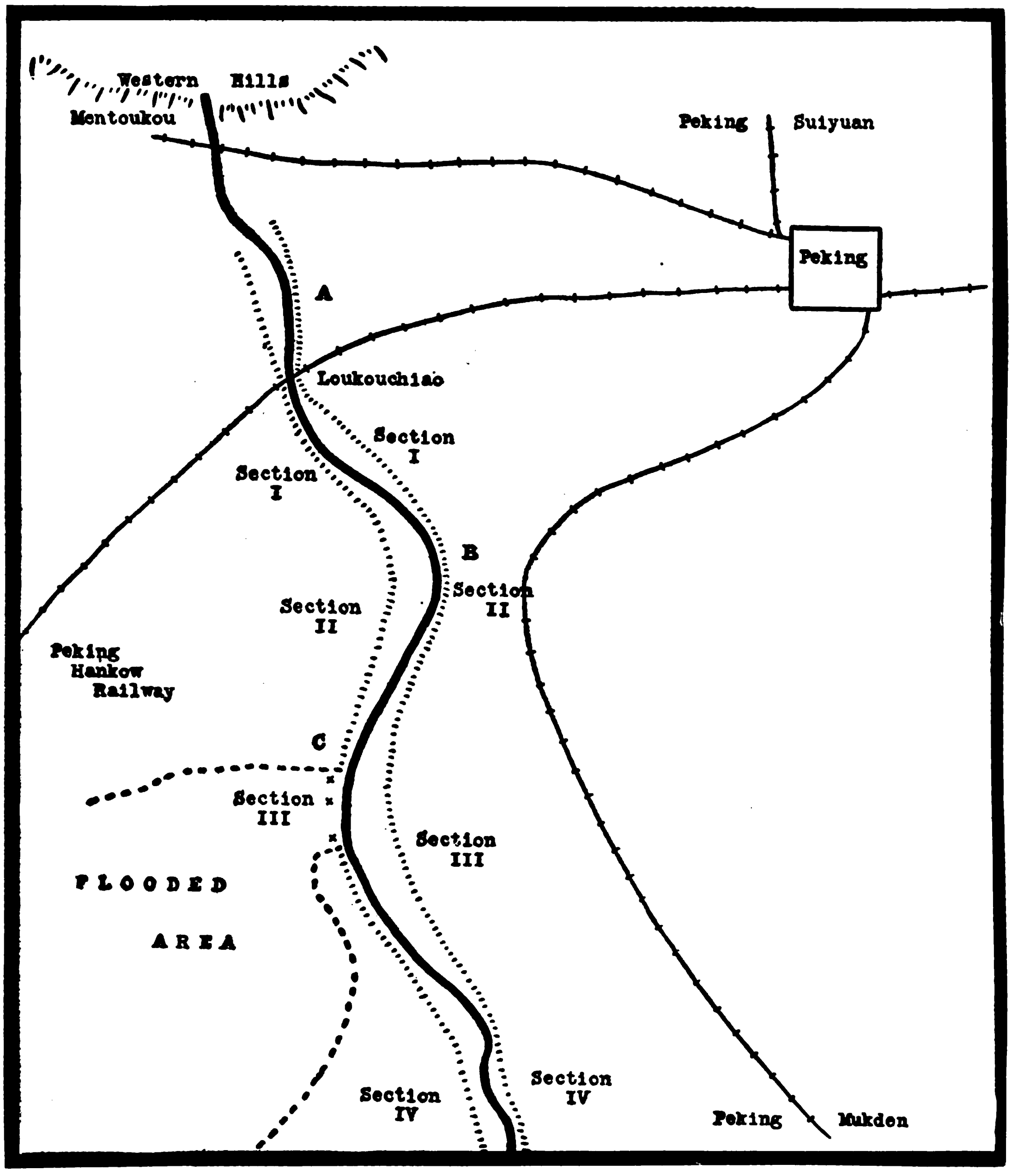


Aeroplane Reconnaissance of Flooded Area—The Pei Ho Flood on Left; The Hsi Ho menacing the Tientsin-Pukow Railway—On Right is Shown a Junk Navigating the Flood near Tientsin

work marked " A " the river turns on a bend to the south-east, and it was here that a very serious threat to the dyke occurred in 1922-1923, endangering the safety of Peking itself. During the dry months of April-June of 1923 a temporary dam was thrown across the channel and the course of the water diverted, thus permitting the construction of a solid concrete wall some thirty feet in height and extending more than half a mile along the face of the old embankment.

The work was successfully put through and is an interesting example of the uses to which the superfluous military in China might be put, for the energy of General Feng Yu-hsiang was able to accomplish more of a constructive nature here in the space of a few months than all the rest of the militarists can show to their credit in an equal number of years. However this may be, the work when done was turned over to the Chinese conservancy board which controls the Yung Ting Ho, or rather shall we say seeks to control it, for the river has only recently set the board at defiance and broken its banks in three places. The writer has perhaps somewhat stressed the word Chinese in connection with this conservancy work, but it has been done with the intention of emphasizing the distinction and pointing out that this is a purely Chinese concern, and has no foreign advisors, engineers, or members as is the case in many other similar organizations in this country. Therefore it may be regarded in the nature of a test as to the degree of preparedness or otherwise for innovations and possible improvements in methods of conservancy on the part of the Chinese officialdom and people.

YUNG TING CONSERVANCY NORTHERN SECTION



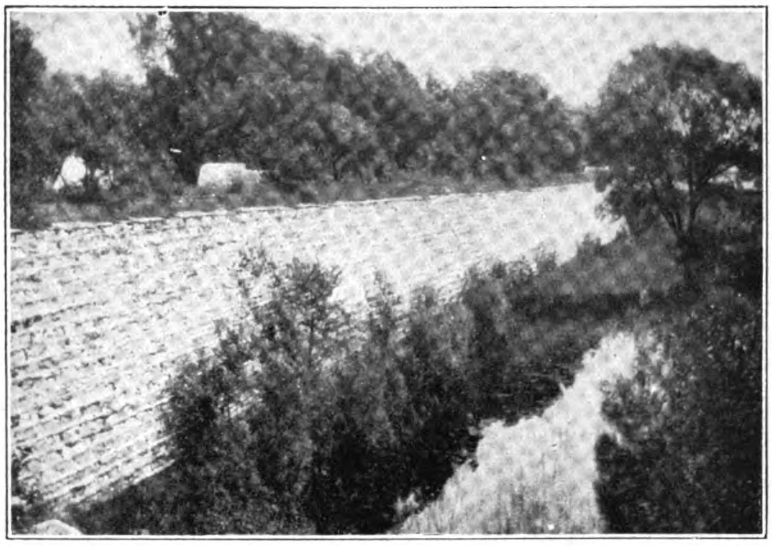
The organization which at present handles the problem of the Yung Ting is built up as follows. At the head of the board is Mr. Wang Fu-yen, and he has the technical advice and assistance of Mr. Sung, a graduate of the Tongshan College, as conservancy engineer. The head office is at Lukouchiao close to the famous Marco Polo bridge, and this is linked up with all the divisional offices by means of field telephones. The area is composed of four divisions, known as the Northern Upper, the Southern Upper, the Northern Lower and the Southern Lower, these being sub-divided into five sections each. Each of the divisions has an engineer in charge, while the sections have a staff composed of an engineer, an assistant, and two inspectors. As the sections only measure slightly over twenty *li* apiece this might seem to be over-staffing, but on the other hand it must be remembered that, as far as the writer could ascertain, none of these engineers is such except in name. They have had no technical training and carry out their duties mainly through an abiding faith in the goodness of Providence. A permanent laboring staff works under these supervisors, some fifty workmen to a section, their numbers being added to as required when floods threaten the dykes.

Turning to a consideration of the river itself the first point which strikes the observer is the great amount of sediment held in its water during the flood season, though at all times of the year the current is so muddy that the bed remains invisible whatever the depth may happen to be. This sedimentation is partly due to the mountainous origin of the Yung Ting and to the fact that the watershed has been absolutely denuded of trees, this combination of circumstances forcing a very rapid rise and fall in the level during the rainy season. The solid matter thus held in suspension in the current is very sandy, so much so that the writer is of the opinion that water gates for irrigation purposes might prove a doubtful blessing to the farmers, although delivery would be an easy matter, the bed of the river inside the dykes being at a considerably higher level than the surrounding country. This fact has been amply proved during the past month or two, for the breaks in the south bank dyke have allowed the Yung Ting to flow southward nearly to Paotingfu ere finding a channel back towards Tientsin, absolutely covering the fields with a deposit of sandy mud.

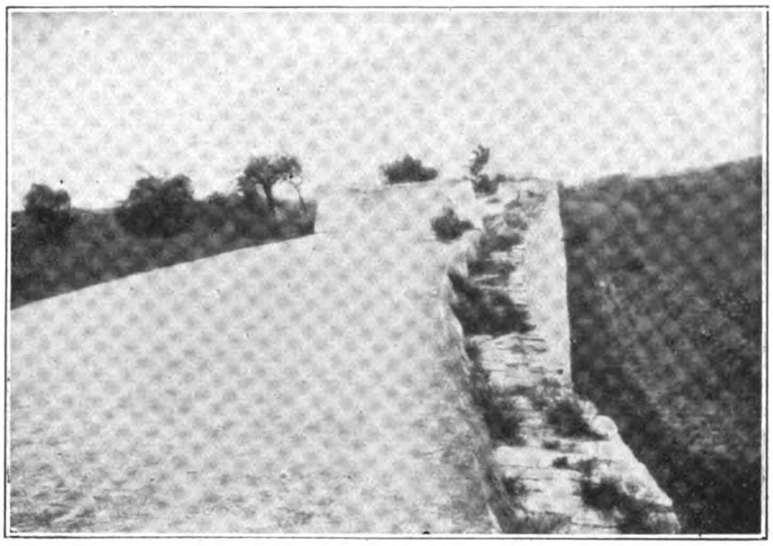
The dykes vary in height from ten to twenty feet and are sandy in their nature, as little good soil is available, while the width of the channel thus traversed by the river varies from half a mile to a mile and a half. It should be noted that quite a little masonry embankment work has been placed above the Marco Polo bridge on the northern bank of the river, and the same may be said in regard to the first twenty *li* to the south of Lukouchiao, this protection work being abandoned after that point on account of the expense incurred in transporting rock from Mentoukou or elsewhere, the river not being navigable at most seasons of the year, while cartage is impracticable. This necessitates other methods of dyke protection, classed roughly under three headings.

Ancient Chinese Conservancy Methods Versus Modern Ones

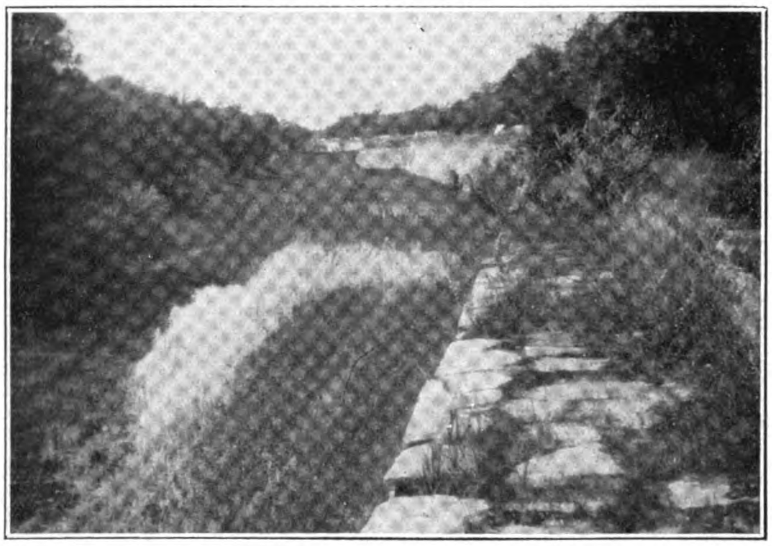
CHIEN LUNG'S DYKES STILL STANDING



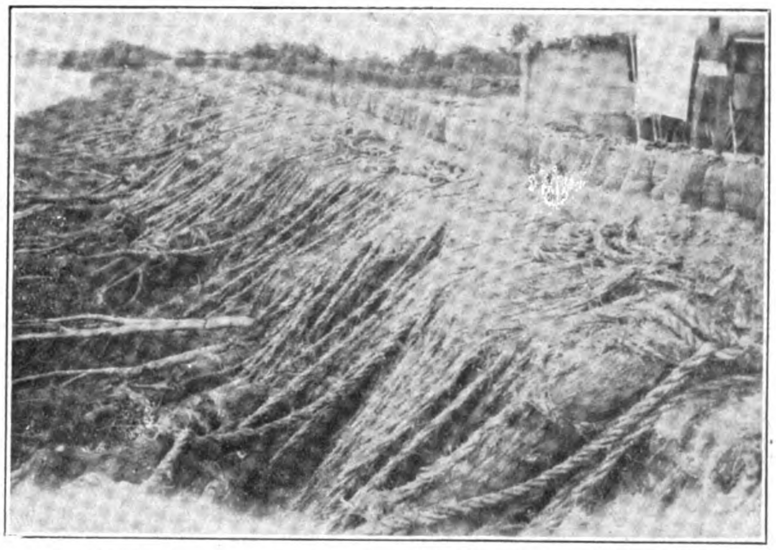
The River Dyke near Lukouchiao Showing Substantial Work of Bygone Days



Top of Lukouchiao Dyke Covered with Cement Work and Faced with Stone



Dyke on North Bank Dating from Chien Lung's Time—It has withstood many Floods

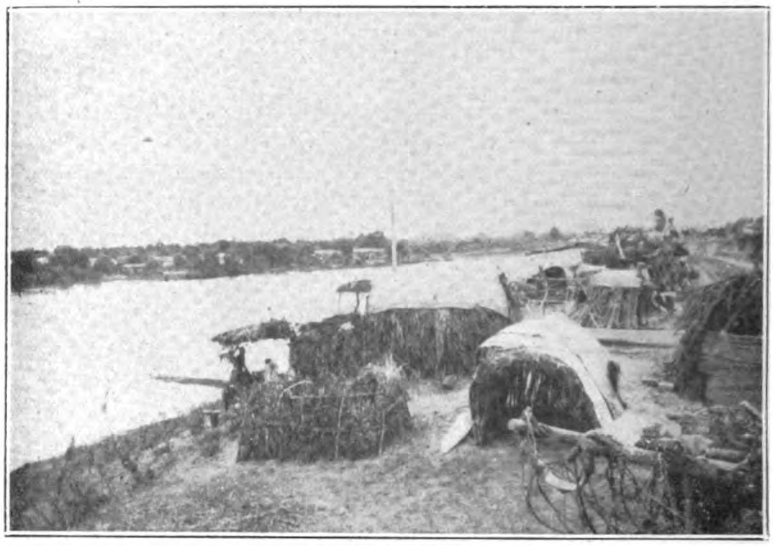


Emergency Protection of Modern Dyke Consisting of Trees Tied with Straw Rope

Dyke North of Tientsin which Barely withstood the Flood now Receding

Tree Protection Work on North Dyke Intended to Cause Deposition of Silt

River Pouring Through Breach in Dyke, Other Side of which is Half Mile Away



Behind the Dyke where the River Has Formed a New Channel Making Islands of the Villages

In some places bundles of kaoliang stalks are laid five or six feet deep pegged down with wooden spikes, wth a layer of earth on top, the process being repeated as often as is judged necessary, the whole constiuction being finally secured by driving twenty to thirty foot wooden piles through the mass. The second practice is to cut down small willow trees or large branches and to anchor these by means of straw ropes to their stems so that the whole mass is suspended over the face of the dyke with the lower end in the water. This causes an eddy, and the consequent retardation of the current causes deposition of the sand held in suspension, so that the river becomes its own dyke builder. The writer has observed several instances where this practice has had very good results, causing quite a marked sandbank to appear within a few days. Thirdly, there is the use of sandbags, which although practised in conservancy work abroad to some extent is usually only regarded as a temporary measure, serviceable in maintaining a dyke against any sudden threat but not forming a permanent surface unless cement be employed, this latter practice leading to expense which is hardly commensurate with the results to be obtained.

It is regrettable that more attention is not paid to the planting of willows on the banks of Chinese rivers, for they grow well, and thereby become a most valuable source of material available in an emergency, while their roots serve to bind the bank firmly. While on the question of materials it may not be out of place to give a few of the prices charged on the work executed by the board, though it should be noted that the figures are for 1923 and that the general rise in costs throughout China has doubtless affected this also.

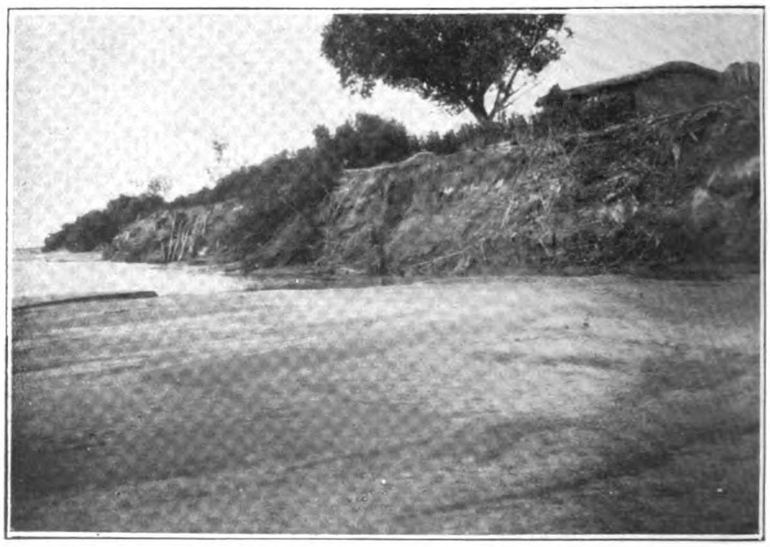
Kaoliang Stalk bundles ..	14′0″ by 14′0″ by 5′0″=9.80 *fong**	$7.00 plus $1.00 transport
Piles	35′0″ by 3″ top diam. and butt...	$4.00 each
	30′0″ ,, ,, ,, ..	$3.20 each
	25′0″ ,, ,, ,, ..	$2.50 each
Ropes, straw or reed ..	200 pieces 60′0″, 24 catties each..	$36.00
Stone ..	5-in. stones, not including transportation	$2.00 a *fong*
	Broken stone, 2½ *fong* within 7 *li* of quarry, add 50 cents per *li* transport beyond this.. ..	$8.00
	Rock slabs, 10′0″ by 1′0″ by 6′	$4.80
Pile driving ..	30.0 at 8 man days	320-800 coppers
	25.0 at 6 man days	240-600 coppers
Earth work ..	100-ft. carry, per *fong*	30 cents
	50-ft. carry, per *fong*	25 cents

Turning from materials to labor costs and salary lists, the figures given for the preceding year were as follows :

	Staff Salaries	Permanent Labor Wages
Upper southern division (five sections)	$700.00	$400.00
Upper northern division	640.00	374.00
Lower southern division	624.00	475.00
Lower northern division	624.00	326.00
Monthly total	$2,588.00	$1,575.00

*Fong equals 100 cubic feet.

Refugees on High Spot in Dyke—Thousands of Others were Drowned in the Floods



One of Dykes that Narrowly Escaped—Flood had Barely Topped it when Waters Began to Recede

To this must be added the head office charges of: Salaries $1,158; wages, 70; telephone, 117; soldiers, 248; sundries, 80; a monthly total of $1,673.

This can be checked against an account inspected by the writer for the expenses on northern upper division section 2 for the period July 11-25, 1924, which read as follows:

Employed approximately 19,986 men-days at one hundred coppers per day, $8,947; purchase of trees, 274; branches and straw, 479; transportation of materials, 451; earth filling on dyke, 147; soldiers' expenses, 391; tools, 495; cups, plates, etc., for workmen, 171; stationery, 17; lighting, 60; rewards for good work in emergency, 28; outside supervision in temporary emergency, 62; office food supplies, 230; tea and paper, etc, 74; fodder, 47; rent, 17; totalling in all $11,890.

To this can be added the following charges for the permanent staff: Engineer, $50; assistant, 12; miscellaneous, 42; Total, $104, a month with foremen's wages $3 plus 10 cents a day for food and permanent workers wages of 1.40-1.60 plus 10 cents a day, or some $235 a month in all.

If this is taken as a fair example of section wages costs and therefore multiplied by five it will be seen that it is about the same as the divisional costs for preceding years, with the addition of 10 cents a day food allowance. The expense account is a peculiar document however, a one which would puzzle most engineers used to an audit of their accounts. The workmen's is higher than would be paid to any kind of coolie in the neighboring city of Peking within the memory of the writer, being $13 a month as opposed to the usual $8 to $10 a month. The question of the purchase of trees is open to discussion, as those growing on or within 100-ft. of the embankment belong to the government and would presumably not be charged for, while the transportation on the remainder should hardly amount to $451. There is also a curious expenditure of $391 on soldiers that calls for an accounting as it is an item that does not as a rule enter into modern engineering practice even in China. Again, if a monthly charge of $495 were to be made for tools one would imagine that a fine equipment might shortly be got together, if each section were to purchase on the same ratio. Finally one may note with interest the item of $74 on tea in a period of a fortnight.

It is regrettable that such a state of things should prevail on such an important site, for if the dyke at B should break it would first flood the Peking-Mukden railway and then seriously threaten the southern portion of Peking itself, the resultant damage being incalculable. If a series of permeable dykes were placed above the threatened spot it is more than probable that the ensuing deposition of silt would avert the danger and enable a fresh facing of the old embankment. This was the remedy recommended by the writer two yeras ago to safeguard a weak spot on the south bank of the river, but apparently nothing was done in the matter. The result was that the dyke gave way at three points this year and the Yung Ting has diverted its course southwards towards Paotingfu, leaving destruction and ruin in its wake.

The map shows the breaks occurred about two miles below the other danger point at B. The river was thrown back from the north bank and impinged on the angle to the south with great force. Training dykes might have enabled the embankment to stand the strain of the unusually heavy flood, but such methods of prevention do not appear to enter into the scheme of things on this conservancy board and the result may prove to be far more expensive than the preventive scheme aforesaid. It will be interesting to see what will be done in connection with these breaks, for they total about a mile and a half in length and would cost several hundred thousand dollars to repair. The fact thatt he old river bed is some ten to fifteen feet above the level of the surrounding country adds considerably to the difficulty of the work.

As a matter of fact it might be an excellent thing if the Yung Ting should find its way south-west across the territory covered by the Ta Ching Ho and eventually cross the Grand Canal and the Tientsin-Pukow railway, thus making a fresh channel for itself to the sea and avoiding Tientsin altogether. Up to the present it has been the combination of the flood waters of the Pei Ho and the Yung Ting Ho that have constituted a menace to that city. As they have their sources in the hills to the north of Peking, they are usually rising at the same time, so that if the waters of one of them could be thus diverted, the channel at Tientsin would prove amply sufficient to accommodate the other. It is not impossible that this result will be achieved without engineering co-operation, for the extra flood let loose by the break in the Yung Ting dykes has so augmented the waters of the other streams to the south of Tientsin that the Hsi Ho reported to have broken loose also and to be threatening the banks of the Grand Canal itself, the last protection of the Tientsin-Pukow railway.

At the moment it can only be pointed out that the menace to Tientsin has been very grave and might have involved incalculable losses both in property and lives, a grim commentary on the policy of *laissez faire* in by-gone years. To what extent the surrounding country has suffered is as yet unknown, for full reports are not to hand, but the photographs which the writer has been able to obtain indicate that the damage must be very widespread indeed, affecting an area bounded roughly by Peking on the north, Paotingfu on the south and Tientsin and the sea on the east. The grain and forage market is a fair medium for obtaining a rough estimate of the conditions in the countryside, and it is worth noticing that the price of various horse foodstuffs advanced twenty per cent. in a fortnight, in both the Peking and Tientsin markets.

It is regrettable that such a state of things as appears to exist in regard to this conservancy work on the Yung Ting Ho should be allowed to continue, for while the area controlled by the Chihli River commission is being surveyed and improved every year as far as funds will permit, the flood threat to Peking and Tientsin grows increasingly great as a result of the vagaries of the Chinese conservancy board for the Yung Ting Ho. The help which has been afforded to them in the past by the China international famine relief commission is thereby wasted. Two years ago it was a matter of a loan of $40,000 which was expended regardless of the advice given by foreign engineers who visited the spot, last year $60,000 was put into the dykes under the board's control, while in 1924, request has been made for another loan of $40,000. One foreign engineer who examined the expenditures stated to have been made valued them at $5,000, and estimated the proposed further construction work at another $10,000; while the writer himself made a trip of inspection and reported that the outlay in his opinion could not have exceeded $15,000 for the season as against the desired $40,000, a result which tallies with the figures quoted by the other engineer inspecting the work.

It is a thousand pities that theie is not a greater force of public opinion in China to-day, for if the people who paid for these mismanagements only realized the state of affairs and apprehended that the loans which they were bled while to repay were either only half expended on the purposes for which they were intended or else frittered away on useless and impracticable repairs with no system behind them they would make a clean sweep of the oiganization which was responsible for their sufferings. It is a disgrace to China that year after year some two or three hundred thousand dollars should be thus wasted on the Yung Ting Ho, when a rational scheme of afforestation and conservancy would enable the danger from the river to be overcome, and render it one of the most fertile sources of irrigation in North China

An Improved Ship's Telephone

The commonwealth steamer *Fordsdale* is equipped with a new type of automatically controlled speaking apparatus, which is the invention of Mr. H. E. Bingham, a Sydney electrical engineer. Designed on similar though improved lines to an appliance known as the "Autophone," the device is termed the "Binghamphone," and is installed on the bridge, being connected with the crow's nest, steering compartment, forecastle, engine-room, and docking bridge, thus making conversation between persons stationed at any of the points possible under all conditions. Formally it was at times a difficult matter for members of the crew to make themselves heard above the noise of the engines, but it is claimed that all that is heard through the "Binghamphone" is the speaker's voice.

Possibilities of China Raw Silk

" By the elimination of silkworm diseases, and without increasing the present mulberry production of leaves, China's raw silk production can be increased 400 per cent.," said Mr. Charles J. Huber, Eastern manager of the United States Silk Testing Company, in speaking to the Shanghai Rotary Club recently. " The effect on filature operations in producing raw silk from cocoons reared from disease-free eggs is still more astounding. The cost of production is lower because the various operations involved, such as sorting, peeling and reeling, are simplified. To produce one picul of raw silk at present requires six piculs of dry cocoons, while with good cocoons this quantity can be reduced to four, which even then is more than the average used in Japan."

There are a number of organizations and schools in China now producing disease-free eggs. The most prominent organization in the Shanghai district, said Mr. Huber, is the international committee for the improvement of sericulture in China. This organization has seven egg-producing stations, and produces over 1,000,000 disease-free layings annually, besides purchasing several million layings in Europe for distribution. This committee receives an annual grant from the government, which enables it to carry on and expand its work.

The Chefoo silk improvement commission is doing much work along the same line, but with the wild, or oak-fed, silkworm which produces tussah silk, the silk used in manufacturing pongee goods.

Both Nanking University and Canton Christian College are producing disease-free eggs on a large quantity basis. Yet with all this work on the production of disease-free eggs, only about one-tenth of one per cent. are produced to meet requirements in China. Before the silkworm disease can be controlled, egg production will have to be developed on a commercial scale, as it is in other countries where silk is produced along modern lines.—*Economic Bulletin.*

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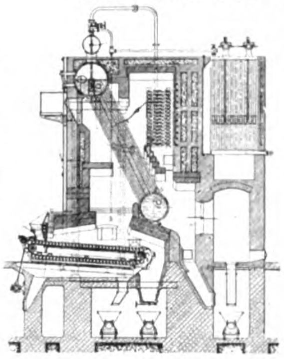
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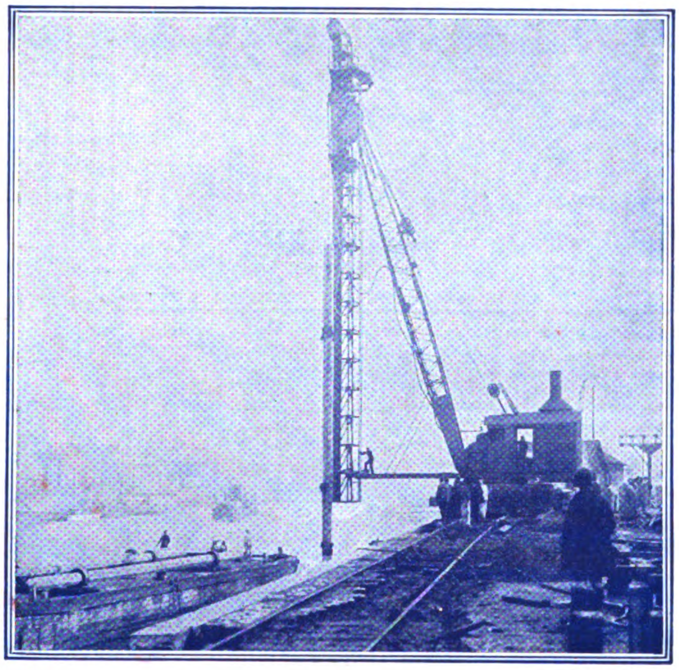
Vol. XX October, 1924 No. 10

A. L. TAYLER.

SHANGHAI, PEKING, TOKYO AND MANILA

A Browning Pays at Least 25% Dividends



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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, OCTOBER, 1924 No. 10

The Full Rice Bowl

Common Sense, Humanity and Practical Christianity Applied to the Boxer Indemnity

WE realize that we stand almost alone in raising a voice against the present trend of America's general uplift program in Asia and anticipate that our temerity in going against the popular will may call down on us the displeasure of that influential element whose combined activities, organized under powerful federations, command the respect of the financial, business and political world. However, we will say at once that we do not disagree with the underlying principles which guide their work nor do we minimize or detract from the merits and importance of their praiseworthy aims, but we do emphatically believe that the whole thing is being overdone to an extent that the material well-being of the living generation of Asiatics is being sacrificed to the objects of a campaign whose benefits will not be visible in this world of sorrow for many decades to come.

The American Policy

In the long run the philanthropic policy of America towards China will probably work out as the best for all concerned. While heartily approving any program that will help to wipe out the abysmal superstition and ignorance pervading the great masses of China, common sense tells us that this is a task which can be successfully undertaken only by the Chinese themselves. The present tendency on the part of western nations to win the confidence, esteem and gratitude of the Asiatic through elevating his educational and moral status while most commendable, takes no heed of his immediate economic necessities. The question as to whether our first duty is to improve his economic status as a foundation on which to erect a permanent political structure or whether his cultural and political education should take precedence, is a matter of opinion.

THE FAR EASTERN REVIEW adheres to the doctrine that when a man's material comforts are assured he is in a more receptive mood to acquire learning. Unless he can find profitable employment it seems unwise to elevate his cultural status to a point where he becomes discontented with his lot and unmanageable politically. The Philippines are a case in point. Here, America has elevated an Asiatic people—who resent the imputation of ever having been "backward"—to a high level of political self-sufficiency but has failed to create opportunities for their employment. We have erected an imposing political structure on a foundation of sand and when the props of American support are withdrawn the edifice will collapse like a house of cards. The logical outcome to our experiment in the Philippines is political unrest, discontent and an incessant clamor for independence. The Filipinos don't like us and don't want us and lose no opportunity in telling us so.

The same system is working out along somewhat similar lines in China where millions of American dollars are being annually poured into the country for general uplift work but not one cent is forthcoming to fill the rice bowl through the creation of industries or the building of railways. The advocates of education as the only safe way to elevate the status of the Chinese have the public ear. They dominate all bodies that make public opinion and through an unremitting propaganda in the press, pulpit and halls of congress have convinced the American government and people of the soundness of their viewpoint. It is not a pleasant task to disparage a movement which exerts such influence on our national activities in this country, as there are more Americans engaged in the various fields of uplift work than there are employed in the legitimate pursuits of trade. Their work has developed into a highly organized, skilfully directed and prosperous industry, supported by the contributions of the American people. It is not to be wondered at that the remission of the American portion of the Boxer indemnity should have provided for its use in cultural uplift, nor is it strange that the policy of the American government has become unalterably fixed along these lines. No amount of common sense, comment or criticism can effect any change in a policy deep-rooted in a religious fanaticism that spreads to every parish in the country. The political power exerted by this movement is too strong for any popular government to ignore or oppose. The huge vested interests of the missionary and educational bodies operating in China and their wide-spread, multitudinous and ever-growing activities call for an expenditure which increases of its own weight and momentum like the proverbial snow-ball. It is difficult to see where it will stop, where a halt will be called to the emotional insanity which now subscribes over $15,000,000 gold annually for uplift work in China. Each year the call for more funds becomes greater and every cent must come from the pockets of the American churchgoer supplemented by donations and endowments from the rich who are easily persuaded of the truth of the biblical proverb concerning their inability to pass through the eye of the needle with the load they have accumulated.

There is a possibility that the whole movement may collapse of its own weight. Only recently a world-wide commission was appointed by the world federation of education associations for the removal of illiteracy throughout the world. As far as China is concerned, the slogan is "China a literate nation in one generation." Most commendable, but where are the funds to come from? The slogan, however, may refer to the next generation or the one following it. Are Americans to be called upon to furnish the millions required to defray the costs of a movement whose financing properly belongs to the Chinese government? Undoubtedly there will be many high-salaried positions connected with this campaign that will be filled by professional American uplifters and paid for by the American committee, but who will carry the load of establishing the schools and paying the salaries of the teachers throughout China? The new movement has taken on a herculean task but one thoroughly in line with the prevailing American idea that we can regenerate the world, ignoring our experiment in the Philippines as a sample of what we will accomplish in China unless the economic needs of the people are given precedence over their cultural welfare.

The British Attitude

It is refreshing from our viewpoint to turn from this wave of educational fanaticism to the most recent manifestation of British opinion on the subject of the proper disposal of the Boxer indemnity funds. It is gratifying to learn that the great federation of British industries has reversed its original opinion concerning the disposition of Britain's share of the Boxer indemnity. Although the federation had originally advocated that the remitted funds be

expended for educational purposes, it modified its views after consultation with responsible Chinese public men and in agreement with public opinion in this country. It now considers that the further education of Chinese students on western lines a debatable matter, endorsing the opinions expressed by THE FAR EASTERN REVIEW that in the present condition of China, these highly trained technical graduates find no opportunity of utilizing their training. Reading between the lines of the telegraphic dispatch announcing this change of front, it can be readily seen that as soon as the federation heard the other side of the long-drawn propaganda of the educational enthusiasts, the common sense of the British manufacturer told him that the greatest educational benefits and general uplift of the masses of China could come only through the betterment of their economic condition, through the creation of industries that would follow the extension of railway transportation facilities.

The federation has accordingly issued a statement asking the government to adhere to the undertaking of their predecessors that industry would be represented in the committee established to decide the purpose to which the Boxer indemnity should be put. If the British chambers of commerce and other organizations in China now take a similar common sense view, it may not be too late to tie a can on the tail of the emotional campaign for education and influence the adoption of a program that will bring immense trade benefits to the community through railway construction, and if properly directed, the movement might compel Peking to give tardy approval to the scheme for the extension of Shanghai's harbor.

With British industry seeking markets and outlets that will provide work for the masses of unemployed and with a long period of business depression staring their traders in the face in China, it would seem that self-interest would influence the British bodies in this country to follow the lead of the federation and support its demand that industry be represented on the committee to decide upon the manner in which the Boxer indemnity is to be expended. In any such program, British industries would benefit exclusively from the supply of materials and enable the British merchant in China to carry on through the impending trade depression. There is a time when nations can afford to be altruistic. There are also times when their own interests become paramount. This is certainly no time for Great Britain to emulate the example of America and enter into any competition with professional political philanthrophy.

The Chinese View Point

THE FAR EASTERN REVIEW is not particularly concerned or interested in the outcome of the present inter-*tuchun* struggle in China except to hope that whoever comes out victorious may establish a government that will bring contentment and prosperity to the people. We have consistently condemned General Wu Pei-fu's program to unify the country by the sword, believing that China has progressed too far along the road of self-government to check the movement by force. However much we may disagree with Wu's political program it does not deter us from heartily commending and supporting his views for the utilization of the combined Boxer indemnities for urgent railway construction. We can readily see how the immediate construction of certain important railways would greatly strengthen General Wu's strategic position and chances of ultimate success, but after all, this is a long way off and before the railways are in operation there may be a radical change in the complexion of China's government. On the other hand, the industrial and economic benefits accruing to the country and its people by the completion of these urgent trunk lines far outweigh in importance the temporary military benefits to any individual *tuchun* or combination of *tuchuns*.

General Wu's plan to allocate the Boxer indemnity funds for railway construction and employ the revenues from these railways for the maintenance of schools is eminently sound, and should merit the support of every foreigner engaged in business in this country. The fact that not one foreign commercial body, chamber of commerce or other organization has come out in defense of their own interests by passing resolutions in support of General Wu's program, is a clear indication of the hold the educational and philanthropic interests have on the foreign community and their organs of public opinion. (The American chamber of commerce at Hankow has recently endorsed Wu Pei-fu's program.) General Wu's views on this subject are worth repeating. He invites attention to the basic truth that the indemnity is contributed by all classes throughout the country. The Tsing Hua College, supported by part of the indemnity funds returned by America, has been instrumental in educating a good many useful sons of China who are rendering good service. In spite of its usefulness General Wu says that in the main only sons of officials, or men of influence, had been admitted and that among students of the same standing and class seeking admittance with a view of gaining higher education in America, the sons of officials and men of influence have better chances. This, the Marshal said, was wrong, as many of the poorer class have had no hope of ever enjoying the privilege.

On the other hand, if hard and fast rules are laid down for the revenues from the railways to be applied for educational purposes, it means that as long as these railways are in operation, there will be funds to educate the masses.

"I am in favor of establishing as many schools in the interior as the revenues from the railways permit," the Marshal continued, "so that the poorest can be benefited. The rich can look after the education of their children, but the poor cannot. The greater portion of the Boxer indemnity is from the poor classes. Not only this, but the railways thus constructed will open the country, and benefit the masses. If my views are followed, it means that the well-to-do class will have a chance of acquiring a better education abroad, while the poorer class will at least have a preliminary education at home which will make them better Chinese citizens and more competent to have a voice in their own government."

These same views are supported by other far-seeing Chinese public men, amongst these, Dr. C. T. Wang, as president of the national association for road improvement, comes out strongly in favor of General Wu's plan, urging that all returned portions of the Boxer indemnity be used for railway construction instead of using the funds exclusively for educational purposes. In a memorial to the government and other commercial organizations throughout the country, Dr. Wang, after pointing out the advantages of General Wu's plan, asks the pertinent question : "If the returned portions of the Boxer indemnity are to be devoted to education alone, which is in itself not a productive or profit-earning enterprise, what is to become of education in China when all these funds are exhausted ?"

It is quite apparent from this question that Dr. Wang had not yet learned of the American plan to make "China a literate nation in one generation," so he goes on to say that "On the other hand, if the returned portions of the Boxer indemnity are all invested in railway construction, the educational funds of the country can depend upon the incomes of the lines built. Such an arrangement, the wisdom of which cannot be questioned, is nothing less than finding a permanent endowment fund for Chinese education in future." Now, if the world federation of education associations honestly hopes to make good on its slogan, the plan proposed by Wu Pei-fu merits its immediate approval. It seems to be the only feasible way in sight for the next ten to fifteen years to finance their campaign. It would be interesting to know just what reaction Wu's plan has upon the educational enthusiasts of the federation.

General Wu's plan has also received the approval and support of many other Chinese leaders, opposition arising only from Dr. Sun Yat-sen who seems to see in this use of the Boxer funds a means for strengthening the power of the northern militarists, but if a large part of the funds are employed to complete the unfinished portions of the Canton-Hankow railway, there should be no reasonable complaint on strategic grounds, as it gives to each rival an equal opportunity to utilize the road for military purposes. If the building of railways will help to put an end to inter-provincial strife and make for unification, the sooner they are built the better.

On the other hand, Dr. Sun Yat-sen, representing the provinces south of the Yangtze, has a legitimate cause for complaint when control over the expenditure of the remitted American portion of the Boxer indemnity is vested in a committee composed in its entirety by office holders serving under the Peking government and sworn to uphold the Chihli party. It is a foregone conclusion that not one cent of these remitted American funds will find its way south of the Yangtze. This one fact would seem to justify Dr. Sun Yat-sen's accusation that the northern militarists are seeking to appropriate for their own purposes the various remitted Boxer funds with no reference to the rights or wishes of those provinces whose revenues make up the bulk of the indemnity. In the event of a break-up of China into independent states it is a certainty that the powers would demand that

each seceded state would take over its proportionate share of the debt incurred by the previous central government, in the same manner that England recently demanded that the newly created state of Iraq take over its proportionate share of the old Ottoman debt. The rule works both ways and in any remission of funds contributed by all the provinces of China, it is the duty of the powers concerned to see that its expenditure is evenly distributed so that all will share alike in its benefits.

From this point of view the handing over of a national revenue contributed by all the people of China to any one faction temporarily recognized by the powers for the sake of expediency, at a time when the country is split wide open by civil war, provides the southern leaders with sufficient cause to charge the powers with a flagrant breach of neutrality in the internal affairs of China. Up to the present, however, the only nation which has committed itself along these lines is the United States, and the time has arrived when Americans in China must give serious thought to a situation in which their national prestige and usefulness is impaired through the blind fanaticism of educational enthusiasts overlook in their zeal the larger problems involved in these infractions of international law. The present disregard for treaties and the rights of foreigners in China may in large part be traced to America's violation of the spirit of the Boxer protocol which for all practical purposes emasculated this instrument of its efficacy. Again, in the recent remission of the balance of the American portion of the indemnity, the educational enthusiasts scored a victory for the advancement of their own special ends without any thought or consideration of how it will affect the internal struggle in China or the interests of the American business community on whose shoulders fall the difficult task of translating our altruism into practical benefits that will help to maintain the standards of living at home which alone permits the nation to indulge in its philanthropic eccentricities.

It is not too late for the American business community in China to break away from the leading strings of the educational fanatics and join with the British in demanding that industry be represented on the committee for the final disposal of the Boxer funds. The associated American chambers of commerce in China, carried away by the appeal of the altruists, went on record last year recommending the return of the indemnity for educational purposes. The British commercial community alarmed at the growth of American prestige through the application of their educational system were also stampeded into endorsing a similar program. The result is before us. We looked for gratitude and have found it in the northern military camps, amongst a party whose fixed policy from the time Yuan Shih-kai assumed dictatorial powers, has been to deny to the south any appropriation of public moneys that might develop its transportation and resources and enable that section of the country to more adequately and forcefully assert its right to a square deal in government. We have earned the gratitude of Peking but incurred the undying hatred of the south, of Manchuria, and of the other independent provinces.

This is no time for foreigners facing a prospective period of business depression in China to further sacrifice their own interests by endorsing a program that will deprive them of an opportunity to tide over a protracted crisis by the use of the Boxer funds for railway construction. It is no time to further antagonize the peoples of provinces who hold themselves independent of Peking. It is time for the application of common sense ideas and it is to be hoped that the leaders of the foreign business communities throughout China will avail themselves of the opportunity still afforded to revise their views on this matter.

They could recommend to their governments that no portion of the returned Boxer indemnity funds be released for expenditure until unification be effected. The release of the funds could be made conditional on the calling of a conference to bring this about. This method of intervention in the affairs of China would be strictly within the limits of international law and welcomed by all parties who seek a solution of the present situation other than unification by the sword. Foreign endorsement of General Wu Pei-fu's program to use all the remitted Boxer funds for railway construction whose revenues will create a permanent fund for the maintenance of schools would seem to be the most effective one in sight and one that will bring ultimate success to the educational movement. The plan will be reciprocal and bring adequate returns to a long suffering commercial community which has passed through a prolonged trade crisis during which many a good firm has gone under while their interests have been ignored in order to placate the inordinate demands of a worthy but ill-timed crusade.

Prostituting Extraterritoriality

Legalizing the Sale of Protection to Chinese Citizens

A Practice Involving the Ownership of Foreign Newspapers in China Prejudicial to All Foreign Interests

The facts, only partially disclosed in the following article, have such a vital bearing on the position of the foreigner in China, that it is the duty of those governments enjoying extra-territorial privileges to protect their prestige and preserve the treaty rights of their law-abiding citizens by starting a searching investigation to ascertain the truth. Unless we are to be hoist by our own petard in the campaign for the abolition of extra-territoriality, it is high time for the foreign commercial community to demand that a stop be put to practices which jeopardize their position under the treaties. The American government maintains a district attorney attached to the United States court for China whose duty it should be to discover the facts and prosecute offenders against the law. Other governments have similar officials for enforcing respect for the treaties. As long as this local machinery of justice fails to function, we cannot expect the home governments to move in matters which so vitally affect the interests of their citizens or subjects in China. If extra-territoriality is to be preserved, a stop must be put to these practices.

IN a forceful editorial on the duty of foreigners to maintain neutrality in the present unfortunate civil war in China, *The North-China Daily News* denounces as iniquitous the practice of registering Chinese citizens in the consulates of foreign countries. This abuse has been carried to extreme lengths in many foreign concessions while Tientsin, says the *North-China Daily News* has become a regular refuge for fugitive militarists and politicians who pursue their intrigues against the recognized government from the safe precincts of its foreign concessions to the general detriment of China, a situation intolerable to the Chinese and to all right-thinking foreigners, Concluding its justly severe condemnation of these practices. *The North-China Daily News* says: "But while Chinese can buy patents of foreign nationality for a sufficient number of dollars,

though they never have been within hundreds of miles of that nation's territories, while property can be removed from Chinese jurisdiction by registration under a foreign flag, while defeated militarists can lie snug and secure within the boundaries of a foreign concession, the Chinese people have a just cause for complaint. A great wrong is being done to the cause of all foreigners in China, the innocent with the guilty, between whom the Chinese cannot be expected to distinguish and it is urgently necessary that the powers shall take notice of these abuses and make them cease."

In these words, our British contemporary sounds the key-note to a campaign that should merit the earliest attention of the diplomatic body at Peking as a prelude to opening the question of the abolition of extra-territoriality, an issue that must be faced as soon as China settles down under some stable government which can take upon itself the obligations incurred under the Washington treaties. Unless this is done and an honest effort made to clean up a nauseating mess, the foreigner is simply arming the Chinese with arguments that will later be employed to deprive him of his privileges. THE FAR EASTERN REVIEW heartily supports the views of its contemporary and emphasizes the real danger to all foreign interests in China arising from the wholly indefensible practice of registering Chinese properties and enterprises in some foreign consulate, either to obtain protection in return for so many dollars paid over or camaflouged under the name of some complaisant national whose respect for his flag has little in common with the higher interests of his own country. While such practices come immediately under the severe denunciation of *The North-China Daily News*, other uncommendable though perhaps more legitimate methods are resorted to in order to conceal Chinese participation in foreign registered enterprises behind the names of foreign trustees who stand before the public as the real owners of the stock. There seems to prevail in Shanghai a nice distinction in the ethics concerned in these matters, denunciatory on the one hand where it pertains to registering Chinese citizens and their properties in return for a stipulated price and somewhat eulogistic in regard to circumventing the conventions by concealing the names of majority shareholders in enterprises financed by parties not entitled to the protection of the flag under which registration is conceded. Sooner or later, this question must receive the attention it deserves, if the rights of foreigners in China are to be respected by the Chinese people and their authorities.

Our views on this matter have been considerably strengthened after reading the testimony in the recent suit against *The China Press* brought by its former editor for breach of contract. The evidence as to the ownership of this newspaper accentuates a very pertinent question that came before the last annual meeting of the American chamber of commerce of China at which time it was ruled that once a company acquired American registration nobody had the right to inquire into the nationality of its majority shareholders by going behind their trustees or figure-heads. This decision seemed to imply a condonation of practices which the chamber as a whole would have been the first to discourage had the opportunity been conceded to properly ventilate the question before the meeting. The ruling shielded an American incorporated enterprise operating in Shanghai from the necessity of revealing the names and nationality of its original majority shareholders and so guaranteed the right of one of the minority shareholders to a seat and voice in the direction of the chamber's affairs. The matter was one calling for most serious consideration, as behind the original question arose the larger and more vital one involving the possibility of private Chinese capital or official funds and subsidies being secretly employed in financing an outwardly legitimate American enterprise, giving to the American figure-heads the right to a seat in the chamber and a voice in drawing up its resolutions.

It is of interest, however, to know that this ruling is not endorsed by the American consul-general who holds that incorporation of a company under the laws of any of the many states does not of a necessity entitle it to registration in the consulate without proving to the satisfaction of the consular authorities that the majority of its shares are owned by *bonâ-fide* American citizens and purchased with their own funds. On the other hand, the ruling of the chamber would seem to stand as an open invitation to the Chinese to use American citizens as trustees for their holdings in corporate American enterprises, guaranteeing protection of the flag without any possible chance that the right to such protection may be publicly challenged. A premium is placed upon this evasion of the law by the regulations in force at the American consulate. In Hongkong it is possible by the payment of a small fee to the registrar to have immediate access to the records and annual reports of any company registered under the Hongkong companies law. In any state in the United States it is possible to consult the official records without the payment of this fee. In Shanghai, however, the utmost secrecy is maintained at the consulate registry office in regard to the official records of incorporated American companies. It is entirely out of the question for the ordinary citizen to obtain access to the reports filed according to law with the consulate, yet these same reports are open to any one who may ask to see them in the departments of the states under whose laws the company may be operating. The system applied at the American consulate and the ruling of the American chamber of commerce therefore acts as a perfect shield against the investigation of corporate enterprises whose majority stock may be owned by foreigners represented in the records by American dummies. The operation of this secret system amply protects those who desire to evade the law and makes it possible to ascertain the facts about such enterprises only when the interested parties are placed on the witness stand under oath to tell the truth.

The practical operation of such a system would make it feasible for Chinese political enterprises—amongst which can be classed the newspaper organs of the various *tuchuns* and factions—to safely flout the Chinese laws and public opinion and carry on pernicious activities against the recognized government from the safe refuge of a foreign settlement without fear of confiscation or penalization. The system makes the American dummies of these Chinese politicians eligible to membership in the chamber of commerce and to a seat on its executive committee where they can pass resolutions and wire them on to Washington as representative of American opinion.

That these methods are being employed to conceal the identity of the real ownership of foreign newspapers would seem to be clearly established by the testimony in the referred to suit against *The China Press*. The facts brought out in the evidence submitted at this trial show that *The China Press* is an American enterprise incorporated under the laws of Delaware and although it does not appear in the testimony, it is easy enough to prove that amongst its original shareholders was the imperial Chinese government which subscribed to $40,000 or $60,000 of the capital stock and placed its holdings in the hands of the late Wu Ting-fang as trustee. From its start, therefore, *The China Press* was a Chinese-American enterprise in which the Chinese official stock holdings were concealed under its American registry.

The testimony at the trial discloses that in due course, the property came under the control of the late Mr. Edward Ezra, a British subject, who owned over sixty per cent. of its shares. The newspaper was then included in the assets of the Shanghai Hotels, Ltd., a British registered company and after Mr. Ezra's death taken over from this company by the Ezra estate. All this time the newspaper enjoyed its American registry and a seat in the councils of the American chamber of commerce.

The evidence at the trial furthermore revealed that early in 1923 a new board of directors assumed control over the management of the newspaper in which the chairman of the board and three of his associates were prominent Americans residing and doing business in Shanghai. It does not appear from the published testimony that there was any actual transfer of a controlling interest that would justify such a radical departure from traditional methods in corporate company management, but there is a guarded line or so in the summing up of the judge which clarifies this matter by referring to the time when the newspaper was under Chinese control in the summer of 1923.

It would appear from the evidence that some time last year the newspaper came under Chinese control and during this period as far as the public was concerned its management and policy were dictated by a board of directors including four Americans and two Chinese, with the power centered in the American members of the board. From reliable sources it is learned that some time early in 1923 a group of Chinese largely composed of *tuchuns* and prominent officials, obtained an option to purchase the newspaper from the Ezra estate and paid over the first installment of the purchase price. The group obviously intended to control and dictate the policy of the newspaper through the American chairman of the board and his associates, remaining in the background screened

effectively from the public by this directorate of minority American shareholders. The Chinese failed to execute their option by paying over the second installment of the purchase price on the due date, and two of the American directors, one of which was the legal trustee for the Chinese funds, resigned their seats on the board and the management of the property reverted to the Ezra estate, which appointed Mr. Arthur Sopher, a French protége, to represent its interests. Yet it would seem from the evidence submitted at the trial that direction over the policy of the paper remained with the American chairman of the board, who never stepped his foot within the office for the year and a half he acted in that capacity.

Altogether, the facts established by the testimony at this trial disclose the rather edifying picture of an American incorporated and registered enterprise enjoying membership in the American chamber of commerce, controlled first by a British subject, then by his estate represented by a French protége, under option of sale to a group of Chinese war-lords and politicians who camaflouged their holdings behind an American board of directors. To heighten the illusion the editor and reporterial staff, were, in the main, American. This chamelion of the press posed before the public as the exponent of American ideals and the organ of American interests! The connection between the facts revealed at the Webb trial as to the real ownership of *The China Press* and the ruling made at the last annual meeting of the American chamber of commerce is so obvious that no comment is necessary.

Now, we invite attention to this state of affairs, as an illustration of how legitimate all this widow-dressing of Chinese enterprises with American drapery has become in the conception of the most respected members of the American cummunity. Instances may be cited by the score where Chinese properties are held in trust by the subjects or citizens of foreign countries now enjoying extra-territorial privileges and registered in their respective consulates under their own name. Selling protection to the Chinese in some form or other seems to be a recognized business, well within the law and sanctioned by many precedents. In fact, if reports are true, there have been many large fortunes made in this highly respectable manner. It is said that a large proportion of the Chinese-owned property in Shanghai is registered under the name of some foreigner who acts as trustee and that this system has given to certain individuals a prominence in the affairs in the settlement which rightfully should not be theirs. As to the truth of these matters, however, we have no direct proof, but so long as such practices endure and are condoned by public opinion, we heartily agree with our British contemporary that the Chinese people have a just cause for complaint. The innocent foreigner in China to further the interests of trade has even a more legitimate right to voice a protest against acts which place in jeopardy the interests of the foreign community as a whole.

At a time when the question of the abolition of extra-territoriality looms ahead as the next and most vital phase in China's long-drawn-out fight to recover her sovereign rights, the secret manipulation of newspaper ownership which may hand over to Chinese control the organs of foreign public opinion, becomes a matter of great importance to every foreigner in China. We are informed on the highest authority that the Chinese group interested in the purchase of *The China Press* was purely national in its make-up, including such names as President Tsao-Kun, General Wu Pei-fu, Dr. Sun Yat-sen, Dr. C. T. Wang, Mr. Alfred Sze and several others. Common sense should tell us that when the heads of the warring factions in China sink their mutual hates and come together to finance a foreign newspaper to be directed by the most prominent members of the foreign community, that their main objective is to control an organ of foreign public opinion during the strenuous campaign that China was proposing to launch last year for the abolition of extra-territoriality. There was only one other common impulse that could have brought these irreconcilables together in such a common cause and that is the continuation of an anti-Japanese propaganda that would have helped them in the proposed fight to recover sovereignty over the Kwantung peninsula.

The facts surrounding these manipulations of stock ownership and registration of Chinese citizens and their properites in foreign consulates is a matter which calls loudly for official investigation by our state department officials and a more rigid application of the laws and regulations which cover these violations of the spirit of the treaties with China. When the most highly respected and prominent men in the foreign community—and this applies to all nationalities—lend their names to such artifices, no matter how well within the law they may be, and public opinion condones their acts, we must not be surprised if others lower in the public esteem overstep the legal bounds and bring discredit on the whole foreign community. As it stands the leaders we look up to defend the position of the foreigner and preserve our extra-territorial privileges until such time as China can be trusted with full sovereignity over our affairs, are now thoughtlessly perhaps, but nevertheless forcibly providing the Chinese with unanswerable arguments that will seriously undermine our position when the fight for the abolition of extra-territoriality is resumed.

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The China Press of October 16, fully endorses the views of *The North-China Daily News* and THE FAR EASTERN REVIEW in denouncing the general practice of prostituting extra-territorial privileges and breaking down the position of the foreigner in China, in so far as it pertains to providing a safe refuge for political refugees and trouble makers within the foreign settlements. This appreciation of the danger to all foreign privileges was influenced by the report that General Hsu Shu-tseng, "Little Hsu," had taken over command of the Chekiang army after the flight of itd former leaders. *The China Press* says:

"Foreigners are very apprehensive regarding the status of their extra-territorial rights, but by permitting political refugees of the Little Hsu type to enter the settlements and continue their plottings within the shadows of the foreign consular flags, they are thus breaking down their own cause on behalf of extra-territoriality."

"The foreign powers on many occasions in the past have considered this matter of permitting outstanding political refugees against whom warrants have been issued by the Chinese governments to live in the settlements, but nothing hal been done to stop the abuse of the settlements because of the old story of failure of the powers to agree on the matter. The present incident should cause serious reconsideration of this vital question and in making this statement we are not intentionally 'aiding and abetting' one side of the present struggle to the detriment of the other. The same thing applies whether the political disturber comes from Peking or Canton."

The argument applies with equal force to the other abuses against the rights of foreigners mentioned above. If conditions, however, were reversed and General Wu Pei-fu and his appointees (to use the words of *The China Press* in describing the defeat of the Anfu party) were in turn "kicked out" of Peking by Marshal Chang and his allies, we doubt very much whether the procedure advocated would be applied. We recall many previous occasions in the recent history of China where "traitors" to the Peking government were acclaimed as patriots and protected by foreigners. We recall Yuan Shih-kai's sudden flight from Peking after the death of the empress-dowager, when the edict had gone forth for his arrest. We recall that he fled to the safe protection of the British concession in Tientsin and that it was largely due to the influence of the British legation that his life was spared and he was permitted to retire to his home in Honan and nurse his "sore leg." We recall that Sheng Kung-pao was characterized as the greatest "traitor" of all, when he proposed in 1911 to unify the railways under state control, yet this did not prevent sympathetic friends in the American legation from extending protection and providing him with an escort to Tientsin from whence he sailed for Japan to spend the rest of his years in exile. We recall that when Chang Hsun was defeated in his attempt to restore the monarchy that he performed a marathon with the Dutch legation as his goal. We also recall that when Yuan Shih-kai dissolved parliament and denounced the Kuomintang leaders as "traitors," that Dr. C. T. Wang and some of his associates were escorted to Tientsin safely under the protection of British friends. The Japanese legation in like manner opened its doors to its friends in the Anfu government when it was overthrown by the Chihli party and declared "traitors." And so it goes. If Wu Pei-fu and his appointees who have received the support and recognition of the powers and the plaudits of the foreign press for the past three years should now in turn be defeated by Chang and proclaimed "traitors" to the republic, we have no hesitation in prophesying that in such an event his foreign friends and admirers would be the first to welcome him to a safe refuge in the international settlements of Tientsin or Shanghai and eulogize him as a martyr to the cause of good government in China.

The War in China

Japan's Absolute Neutrality and Determination to Avoid International Complications: Soviet Activities

THE war in China is still dragging along. Up to date its progress is fairly well covered in a general way by the description of Chinese military tactics so faithfully portrayed by Mr. J. O. P. Bland in his book, "House-boat Days in China," reprinted in the September number of THE FAR EASTERN REVIEW. The salient feature of the early stages of the war was the betrayal of Marshal Lu Yung-hsiang of Chekiang by two of his generals on the Fukien border which forced Lu to fly from his capital at Hangchow and take refuge with his troops in the field at Lunghwa, near Shanghai. This traditional Chinese manœuvre was duplicated this month by the further betrayal of Marshal Lu when another of his division generals refused to continue the fighting on the Tsingpu front. In this, the mutinous general seemed to have the support of other members of Lu's immediate *entourage*, so sensing that he had been sold out, Lu, made a hasty night retreat into the international settlement boarding the N. Y. K. express steamer leaving the next morning for Japan. He is now in that country and his armies in the trenches around Shanghai are without a leader. The war in the Shanghai district is practically over.

In the north the war between the better trained and equipped troops of Marshal Wu and Marshal Chang has produced some severe fighting but the stories trickle through from Tientsin and Peking that several of Wu's trusted generals have been bought over by Chang and his ally, Marshal Tuan Chi-jui, the leader of the Anfu party. The Christian General, Feng Yu-hsiang, one of Wu's stalwarts, is described as sitting on a fence refusing to take sides, evidently waiting to see which way to jump in order to land safely on the band-wagon of the victor, or, he may be patiently awaiting his share of the common treasury loot for the payment of his soldiers. If these reports are true, then Marshal Wu is getting a dose of the same medicine he administered to Marshal Chang two years ago when two of the latter's trusted generals went over to the other side in the heat of the battle for the possession of Peking. This treachery gave Marshal Wu control over Peking, and as the foreign powers adhere to the policy that whoever holds Peking is the *defacto* government of China, it has enabled Wu's appointees to entrench themselves in power and collect the surplus handed over by the powers in control of the customs and salt revenues.

Meanwhile, the war in the north goes grimly on and it is only fair to state that the Chinese soldier has exhibited wonderful courage and withstood punishment under concentrated machine gun fire that decimated whole regiments and battalions. It is the first time the Chinese fighting man has gone up against modern artillery and implements of war. He has stood the test in a manner which elicits the highest commendation. If these men are ever animated by a love of country or some impelling ideal the world may well tremble for its peace. It may be that the individual Chinese is a pacifist and will lead the world in finding a way towards universal peace, but if this war means anything at all it means that the Chinese are changing. They have had their first test and in the main have stood up well and realize their power. Given a worthy object to fight for and a united nation behind them, their next foreign war will surprise the onlookers.

It is too early to express any opinion as to the final outcome of this sordid struggle for power. Intelligent foreigners have lost interest in the petty issues which divide the rival factions and would welcome almost any settlement that will put an end to a situation that is fast driving them into bankruptcy.

Japan's Absolute Neutrality

One feature of the war cannot but fail to command attention. The world moves and for once in recent years, Japan has escaped the accusation of having aided or abetted any one faction. The only newspapers which have tried to connect Japan with the present upheaval are those owned by Hearst. This need not be taken seriously, however, as Hearst seems to have made it his particular hobby and business to provoke and worry Japan and the Japanese are so used to it by this time that if he stopped picking on them they would feel like a dog which had lost its pet flea.

There was a time not long since when nearly all foreign newspapers in China were ready to lay the blame for all of China's woes on Japan. This attack of Nipponophobia has passed. Even Hearst's prototypes in the foreign newspaper field in China are unable to work up a serious argument or cite any incident that might in the most remote manner connect Japan with the present trouble. The Chinese native press, in the past suspicious and abusive of Japan, has come to its senses and in commenting on the present situation has been extremely fair and moderate in referring to Japanese policies. Nearly all the better class Chinese newspapers praise Japan's attitude in preserving a strict neutrality and admit the justice of her announced intention to take action only if her vital interests in Manchuria are jeopardized by actual fighting in the S. M. R. zone. Other Chinese see in the present civil war an opportunity to improve the friendly relations now existing between the two peoples.

The only direct accusation that Japan has violated her neutrality arises from the fact that the Japanese owned South Manchuria Railway has transported Chang Tso-lin's troops from northern Manchuria to southern Manchuria points, an obligation that could not well have been escaped without raising more serious questions. Refusal on the part of the S. M. R. officials or the Japanese government to permit the use of the railway for transporting Chang's army would probably have resulted in the seizure of trains or damage to the track and bridges on the part of infuriated Manchurian soldiers, compelling Japan to send a large force for the protection of the line, a wholly unprofitable undertaking. The Japanese government rightly claims that the granting of permission for transporting Chinese troops over the S. M. R. is in accordance with precedents and does not in any way constitute a breach of neutrality in China's civil war.

In the same manner that the Japanese line moved Chang's soldiers it would carry Wu's troops should they be victorious. During the war between the Chihli and Anfu factions a few years ago, the S. M. R. transported soldiers belonging to the same Mukden party but no protest was made by the Peking government solely because it was allied with Marshal Chang at that time. At any rate the official statement has been made by the S. M. R. authorities that Chang's soldiers were transported before hostilities were declared, at a time when it was impossible for a third party to anticipate a war between Mukden and Chihli. The S. M. R. recognizes Marshal Chang as chief of the territory it serves and as long as Peking exerts no authority over Manchuria, it has no option but to conform to the official requests of whoever is in power at Mukden.

International Complications Forstalled

This incident opens up what may develop into the most important phase of the war, for although Japan will maintain a strict neutrality and exert all her diplomacy to prevent hostilities being carried into the South Manchuria Railway zone, she will move if it becomes necessary to protect her important interests in this territory. There is no immediate danger of a development which could only arise if Chang is defeated and his retreating forces are followed by those of Wu to any point in Manchuria beyond the Liao River. There would be ample time if this happened for the Japanese government to enter into friendly negotiations with Wu that would obviate the necessity of dispatching Japanese troops for the protection of the South Manchuria Railway. There is little reason to doubt that in such an emergency Marshal Wu would gladly give the necessary assurances that Japanese interests would be respected. When faced with Japan's determination to protect at all hazards her immense vested interests in Manchuria, it is safe to predict that Marshal Wu will be extremely careful not to precipitate a situa-

tion that might carry with it foreign intervention on a scale that would put an end to his dreams of power.

It is for this same reason that Japan will exhaust every peaceful means before taking a step which might precipitate a greater calamity upon China, for it is a certainty that if Japan should dispatch an army to defend her interests in Manchuria, other powers would repeat their Siberian blunder and ask that such intervention be made international, justifying their request on the existence of large foreign interests in the international commercial settlement at Mukden. In such an event, the same old story will be repeated. Americans will feel that they are in Manchuria solely to watch Japan. The British will work with them and the fat will be in the fire. Having such a situation in view, the Japanese government would probably ignore any communication from the other powers for common intervention in Manchuria, and go it alone. If other powers insisted upon sending forces for the protection of their interests in Mukden, that would be their own affair, in the same manner that if it should become necessary for the protection of Shanghai to police or place the Shanghai-Nanking Railway under foreign direction, Great Britain would have to take over the job in combination with those powers who sympathize with her viewpoint. Japan would take no part in the protection of this railway, respecting and acknowledging the right of the British to guard their own property interests. In the same manner, Japan would exact absolute freedom of action in whatever steps might become necessary to defend her own vital interests in Manchuria.

Trend of Soviet Propaganda

A very significant feature of the present war in China is the new trend given to international political propaganda by the re entrance of Russia into the game of diplomacy as played in Peking. In seeking for the actual causes of the war it is universally accepted that militarism lies at the bottom of the trouble. This may be the basic cause, but there exists ample evidence that the Soviet has worked on this foundation to stir up trouble to further its own ends. Since the Soviet ambassador obtained a firm foot-hold in Peking the general attitude of the Chinese government towards the foreigner has undergone a decided change. The demands of the diplomatic corps thereafter have received slight attention and to its protests for the creation of a zone of neutrality around Shanghai, the Peking government turned a deaf ear. At the very outbreak of hostilities, stories began to appear in the American newspapers that Japan was behind Chang Tso-lin and his allies, Lu Yung-hsiang and Sun Yat-sun. Simultaneously the press in Japan was flooded with the wildest inventions to the effect that the United States was supporting Marshal Wu with money, arms and military advisers. Foreign Minister Koo was reported to be in direct communication with Secretary Hughes and as a result of assurances received from the latter, Peking had decided to carry through the campaign for unification by the sword. This attempt to incite suspicion and ill-will between the two countries was traced directly to Peking and to sources of information very close to the Soviet embassy.

According to this propaganda, liberated from Soviet sources, the war was traceable directly to the desire of the arch-representative of world capitalism, Secretary Hughes, to bring about intervention in China and place her under the yoke of international finance now dominated by the American bankers. The Russian prolitariat was worked up to a frenzy over this attempt to undo the Soviet treaty with China, causing the *Izvestia* to declare that Great Britain, France, America, and Japan are not merely indirectly but directly attacking the Soviet union by sending warships to Chinese waters. " It is not only military interference with China's domestic affairs, but the beginning of a new world conflict. Intervention is aimed against China and the Soviet union because we made the Chino-Soviet treaty. Great Britain, France, America, and Japan intend to partition China. What can stop them ? Only the revolutionary proletariat and above all the Chino-Russian alliance."

Under official auspices the Bolshevists have organized a" Hands Off China Society " at Moscow, which has issued an appeal to the world against the " Imperialist brigands who attack China's independence." The manifesto designates opposition to Sun Yat-sen as a new universal war, which must spread beyond China's territories. "Down with the Anglo-American, Franco-Japanese highway robbers." A member of the foreign commissariat's collegium, Rothstein, and other prominent officials joined this clamor. Rothstein officially declared that Great Britain armed the anti-Sun Yat-sen party from Hongkong arsenal, and Britain threatened to interfere at Canton if civil war began there, but the Soviet union protests with every fibre of her being against this intervention, which involves the whole Soviet position in the Far East.

As a result of this Soviet propaganda, opinion in Germany sees in the civil war raging in China the first act in the tremendous revolt of Asia against Occidental domination, especially against the Americans and British.

The writer of a striking article, covering most of the first page of the *Deutsch Zeitung*, declares that Japan and Soviet Russia are busily pulling strings in China for the purpose of bringing about an alliance with the latter which shall eventually drive Occidentals out of Asia.

The United States and Britain, continues this writer, are already taking steps to thwart this scheme. According to this theory, Japan first favored Chang Tso-lin, the Manchurian war lord, but later decided to support the central Chinese government in Peking, believing that a strong centralized China, with Peking as the capital, would be the most valuable ally for Japan and Russia. Thereupon the United States and England, it is asserted, decided to back Chang Tso-lin, and England sent him large quantities of arms and munitions to help him in trying to overthrow the Peking government.

The moves now on near Peking and the battles near Shanghai will decide China's fate. It is declared in other words, they will determine whether the United States and England, through a victory by Chang Tso-lin, will forestall the attempts to oust them from the Far East, or whether Japan and Russia, through the victory of the Chinese republican forces, will bring nearer the day when a triple alliance of Japanese, Russians and Chinese will throw down the gauntlet to Americans and Britons and demand that they leave Asia to the Asiatics.

This article, said to be written by a diplomat well versed in Oriental affairs is worth attention only because we see here the working of a force that effectively counteracts any anti-Japanese propaganda that might try to connect Japan with Chang Tso-lin. It is not Wu that America is backing but Chang and the Japanese are not behind Chang, but Wu. The German diplomat is seemingly living up to that national reputation for perspicuity in international politics which won for them the world war.

Soviet propaganda is being concentrated upon devilling America until it is accorded recognition, harping on the warning that unless this comes soon, it will drive Russia into the arms of China and Japan for the creation of a league that will mobilize Asia against our interests. In the meantime it is having one beneficial effect. As long as the Soviet can put over their dope, it will be extremely difficult for the professional anti-Japanese agitator to attract public attention to his tales of woe about the doings of the Japanese.

Anticipating the Inevitable

While posing as the champion of China against the "capitalistic western powers," the Soviet is living up to its reputation for slippery diplomacy by entering into a separate treaty with Chang Tso-lin, the over-lord of Manchuria, which in its practical application has been equivalent to a *coup d'etat*. Moscow's recognition of an independent Manchurian government after establishing diplomatic relations with the sovereign power at Peking is an added proof of its perfidy in dealing with Asiatic peoples, in line with its fixed program to unsettle the affairs of neighboring states as a preliminary to their absorption into the union of Soviet republics. Mongolia is already lost to China. Sinkiang has signed an independent trade treaty with Moscow and now Manchuria is started along a road that will ultimately bring her under the same influence. A Soviet delegate is attached to the government of Sun Yat-sen at Canton, so the conclusion of the Manchurian agreement gives Moscow five diplomatic representatives accredited to the various so-called independent governments in different parts of China. While such inconsistencies are highly characteristic of Moscow's diplomacy, yet open-minded observers must admit that the Soviet is simply taking the lead in arriving at a solution of China's problem along lines endorsed by competent American and British observers as the only practical way out of the present morass of militarism.

Dr. Schurman, the American minister to Peking, has declared himself in favor of a federal government in China supported by the independent or self-governing provinces, while Sir John Jordan, the foremost British authority on Chinese affairs, has also expressed the opinion that a "United States of China" is the only practical way to reunite the provinces under one central authority. Both of these solutions are obviously based on a recognition of provincial independence, an acceptance of the accomplished fact, which the powers for reasons of their own have ignored in order to uphold the supremacy of Peking for the sole purpose of preserving continuity of diplomatic relations and responsibility for acts which Peking is powerless to control. The picture presented by the concert at Peking is the most roaring diplomatic farce that has ever been enacted on the international political stage and it is no wonder that the astute Soviet leaders have taken advantage of the situation to advance their own ends under cover of a principle which has received the approval of the best American and British experts.

If the only practical way to reunite China is through the establishment of a federal govenment at Peking, this carries with it acknowledgement of the principle that the provinces are and have the right to be independent. This being so, Moscow has simply blazed the trail over which the other nations must follow. Jealousies between the powers and the fear that one may obtain some advantage over the other by independent action is playing into the hands of Moscow. Sooner or later we will wake up to find a situation precipitated that will compel the abandonment of neutrality in the affairs of China unless the powers come together and formulate some forcible program that will stabilize conditions in this country. Otherwise, the future control of China will drift into the hands of the little group in Moscow whose avowed purpose is to use the Chinese people in their fight to bolshevise the world.

The Soviet-Manchurian Agreement

In the Manchurian agreement the Soviet has flouted Peking, contemptuously ignored the French interests in the Russo-Asiatic Bank which financed the construction of the Chinese Eastern Railway and in so many words has told Japan and the United States where to go to with their financial claims on the railway. The agreement consists of seven articles, two of which, the longest and most important, provide for the administration of the Chinese Eastern Railway by a joint Sino-Russian board of directors with its operation controlled by Russians. Chinese public opinion is pandered to by a clause reducing the time-limit for the reversion of the railway to China from eighty to sixty years with a proviso that even this limit may still further be reduced by mutual consent. A further sop to Chinese sentiment is contained in the equally empty clause providing that from the date of signing the agreement China shall have the right to redeem the line at a fair price.

The reduction of the time-limit carries the same significance as the original twenty-five year term to the Liaotung lease at a time when Great Britain, Germany and France were exacting ninety-nine year leases for Kowloon, Kiaochow and Kwangchowwan. Russia never had the slighest intention of living up to the terms of this lease, proceeding immediately to convert Manchuria into a closed preserve in which foreigners would not be allowed to reside or travel. Her defeat at the hands of Japan was the only argument that could have moved her to evacuate Port Arthur and Dalny. So the reduction of the time-limit for the reversion of the C.E.R. to China is only another dodge to impress the credulous Chinese and embarass the Japanese in their position in South Manchuria. There is no more prospect of China redeeming the C.E.R. by purchase within the next twenty-five years than there is for her to redeem the S.M.R.

The only effect of this agreement will be to complicate further the already highly complex Far Eastern political situation by bringing Russia once more into Manchuria and making Japan's position still more difficult. The agreement has accomplished its purpose. The Soviet has moved into Harbin and taken over control of the Chinese Eastern Railway. The treaty has outraged international conventions but it will stand. As soon as a federal or some other form of central government is once more exercising authority, the Peking agreement with the Soviet will automatically extend to Manchuria and supersede the agreement with Chang Tso-lin. It would seem that the Soviet has simply anticipated the inevitable, taking advantage of the dissentions of the powers to re-enter into possession of the old Russian rights in the C.E.R.

Japan at the Cross-Roads

Who will interfere? France can do little to defend the interests of the Russo-Asiatic Bank as long as Chinese and Russians contend that the sale or transfer of C.E.R. bonds to citizens of countries other than China or Russia is illegal. The United States will hardly go further than a diplomatic protest in order to protect the American financial interest in the C.E.R. created by advancing $5,000,000 when the line was under international control. Japan alone might take decided steps if her vital interests in South Manchuria are menaced. Japan has no desire to fight anyone at this time as long as her rights in South Manchuria are respected. From her point of view America, Great Britain and France are equally interested in preserving China's integrity in Mongolia and Manchuria, a doctrine they forced down Japan's throat with the consortium agreement, so unless they are willing to support their policies by force, it is foolish to believe that Japan will invite hostilities single-handed with the Soviet, when she can avoid such a catastrophe by an amicable understauding.

From whatever angle we approach it, the new aspect given to Manchurian affairs is far from reassuring. The re-entry of Russia into North Manchuria and control over the C.E.R. must be accepted as a brilliant Soviet victory which may force Japan against her present inclination to join the new Russo-Chinese-Asiatic *bloc* as the only alternative to another disastrous war for which she has no heart and is ill-prepared to meet. On the other hand, Russia may rest content for a time with her recent gains and not complicate matters further by raising issues that may vitally affect Japan's position and rights. Japan also may be quite ready to renew her old understandings with Russia in regard to the maintenance of mutual rights in Manchuria and Mongolia, rather than invite a situation that would call for constant military preparedness to meet the possibility of a clash that Japan would have to face alone—thanks to the American diplomatic victory at the Washington conference which preserved peace in the Pacific but deprived Japan of her one insurance against war in Asia.

The present government of Japan is animated by a sincere desire to shape the destinies of the empire along lines that will bring about closer relations with the United States and the liberal peoples of the west but there is an influential element in that country which advocates a closer understanding with Russia. A sudden cabinet crisis may bring this element into power and align Japan once more with Russia, a possibility that has been brought immeasurably nearer by the attitude of the American government in the recent immigration *imbroglio.*

New Taikoo Launching

THE largest boat ever built to the order of the China Navigation Company was launched at the Taikoo Dockyard on October 4, when Miss Gladys Grace performed the naming ceremony of the s. *Anhui.* This vessel, which is of the awning deck type, has an overall length of 350-ft., a beam of 49-ft. and 34-ft. depth to awning deck, built to scantlings approved by the British corporation on the deep framed system, with a cellular double bottom all fore and aft, three complete decks, and four cargo holds. A large steel deckhouse amidships has accommodation for 20 first-class passengers with saloon at fore end. On the promenade deck are staterooms and saloon for eight saloon passengers. The dining saloon has been designed and panelled in dark hardwood. The officers and engineers are accommodated in rooms abaft the passengers' staterooms. On the boat deck in a steel house are the captain's room with chart room forward. At the after end of boat deck is a steel house for the wireless operator and a room for the officers' recreation, combining smoke room and music room for their use. The vessel has ten steam winches and ten derricks arranged for 2, 5 and 10-ton lifts, while provision has been made for a 30-ton derrick. Electric light is fitted throughout the vessel and a plentiful supply of fans. Eight lifeboats are housed on boat deck, the davits being fitted with Turnbull's patent turning out gear. The machinery consists of one set of geared turbines of the Brown Curtis type, supplied with superheated steam from three multitubular marine boilers having a working pressure of 220-lb. per square inch. Turbines and boilers have been constructed by the Taikoo Dockyard. A speed of over 13 knots is anticipated.

Immediate Filipino Independence

Repeal the Exclusion Act

"The Filipino people have succeeded in maintaining a stable government and have thus fulfilled the only condition laid down by congress as a prerequisite to the granting of independence. We declare that it is now our liberty and our duty to keep our promise to these people by granting them immediately the independence they so honorably covet."

THIS flat statement of policy in the platform of the democratic party admits of no misinterpretation. It means exactly what it says and if Mr. Davis is elected president of the United States he will be called upon to live up to his party's pledges and give immediate satisfaction to a people who notwithstanding their many shortcomings have the courage to want to paddle their own canoe. The Filipino viewpoint is sound. They scout as absurd the republican party's idea that independence should be conceded twenty-five years hence, declaring that they have already passed through twenty-five years of training under American direction and have now arrived at maturity with a full capacity for self-development. It is nothing short of silly they say for men in power to-day to commit themselves as to what is to happen twenty years from now. Not only will they be out of power but out of this world and another twenty years of imposed government is apt to have a disastrous effect on men yearning for freedom and facing the possibility that new arguments will be advanced to maintain them in further bondage.

If these views have been accepted by the democratic party and incorporated in its platform in language that admits of no misunderstanding, Americans in the Far East must be prepared for withdrawal from the islands as soon as the democratic party comes into power. It may be next year, it may be four or even eight years hence, a few years more or less does not matter, but the pledge will stand and will be kept. Each year the clamor for independence will become louder and carry with it a growing unrest amongst a people who are liable to translate their discontent into action.

There will be considerable difference of opinion as to the wisdom of carrying out the national pledges reaffirmed in the democratic platform due to the bearing Filipino independence has on our present conception of strategic needs in the Pacific and its relation to international politics. To date, the issue has been remarkably free from any suggestion that an independent Philippine republic might be endangered through Japanese aggression. Fortunately, that bugbear cannot be conjured up as an argument against complying with our pledges to the Filipino people while Japan is a party to the four-power agreement. The Filipinos do not fear Japan. Mr. Quezon, leader of their fight for independence and probable first president of the new republic, says flatly, "Japan does not want the Philippines." The Japanese, he adds, "cannot live there. Some 15,000 Japanese laborers were introduced in the hemp fields some years ago and they died like flies. If Japan were aggressive, continued Mr. Quezon, she had every chance in the world to annex the Philippine Islands during the three centuries of Spanish rule. Japan demonstrated that she was a peace-loving country when she returned Shantung to China."

Quezon talks sense. The Filipino leaders have undoubtedly held many conferences with representative Japanese and received assurances in which they place implicit confidence. If the Filipinos are satisfied, it is no one else's business. Unless the United States is in the Orient on imperialism bent, neither can the argument that we require a permanent naval base in the Philippines be advanced as a reason why we should violate our promises to the Filipinos. Quezon sounds an appealing note when in answer to this argument, he remarked that it was time for the world to talk of permanent peace bases, and this sentiment we are sure, will find an echo in the hearts of the American women whose votes will largely decide the coming election.

Although we incline to the belief that the Filipinos are not yet on an economic basis that will enable them to stand alone, this again is their own affair. The one thing that concerns Americans is the condition attached to our promises—*their ability to govern themselves*. This will always be a debatable question and decided, not on its merits but along strictly party political lines, with the republicans insisting that the democrats made a mess of things when they were in power and the latter equally insistent that they faithfully carried out their pledges to the nation and that the islands were brought to a high state of self-government where independence was in sight until their work came under the scrutiny of the Woods-Forbes mission. So there is little profit in taking sides in a debate which has degenerated into an acrimonious mud-slinging political wrangle. The Filipinos point with pride to what they accomplished when they had a chance and bring forward facts and figures to prove that they are now fully able to manage their own affairs. They may be too optimistic but as long as they insist on their viewpoint and can get their story printed in the American press, there will always be a majority of the American people who will sympathize with them. The Philippine plank of the democratic platform will appeal to Americans as being in line with the principles underlying their own national life and if the election could be decided on this point alone, there is little doubt of what the verdict would be.

Such a verdict would reflect in no manner on the labors of the officials appointed under various republican administrations to direct the affairs of the islands nor could it dim in the slightest the splendid record of Governor-General Leonard Wood. It would mean, if anything at all, that the American people are living up to their traditions and refuse to hold a people in political bondage because of sordid commercial or untenable strategic and political reasons. The Filipino problem simmers down to a moral issue, in which dollars and cents and battleships and bayonets has no place. We must either live up to our pledges and concede independence to the islands or invite suspicion that we are as much to be feared as any other imperialistic power. And our policies in those countries whose shores are laved by the Caribbean will give strength to this sentiment.

There are angles to Philippine independence bearing on purely Far Eastern affairs which seem to be imperfectly understood at home. Americans residing in the islands, all advocates of postponing during their lifetime the fulfillment of our pledges, point with pardonable pride to the trade returns as a reason for hanging on, but the fallacy of their arguments would seem to be fully proven by the figures given elsewhere in this number of THE FAR EASTERN REVIEW in a discussion of the labor situation arising from an expert investigation of the sugar industry. The gain to the national economy from our exports to the Philippines is offset four times by the amount of indirect subsidy conceded in tariff reduction on Philippine sugar and tobacco. It is true, perhaps, that the trade between America and the islands is capable of great expansion. This also is true of our trade with many other sections of the world, notably with China and Japan.

If there was any possibility of the United States ever reaping a reasonable profit from its investment in the islands, we would

change our views in this matter but to date all evidence seems to point to the fact that our exports to the Philippines will expand only in proportion as their resources are developed and the purchasing power of the people increased. The only large scale development in sight is a further increase in sugar production, an industry so dependent on the remission of our import duties that it could not last a day after this tariff concession is withdrawn. It would die a natural death if even the industry was placed on a plane of tariff equality with the Cuban product. The prospective increase of the insular sugar industry in a few years to an output of one million tons simply means an increase of the tariff subsidy to $40,000,000, much more than the present entire revenues of the islands. Granted an abnormal profit of ten per cent., this would represent $400,000,000 of American exports, or eight times our present sales. We doubt very much if the purchasing power of the Filipino will keep pace with such an increase of the subsidy, and the result will be as pointed out in another article, the maintenance of the Philippine farm laborer in an idealistic soviet paradise.

Outside of sugar, there is no probable expansion of insular resources that holds out the promise of adequate returns on the capital investment so long as the present land and labor laws remain in force. The government owns some 73,000,000 acres of the public domain all available for agriculture and industrial development, yet at the expiration of twenty-five years of American rule, only 7,300,000 acres or one-tenth the public lands have been brought under cultivation. The American government hesitates to throw these lands open for fear that rapacious foreign syndicates will deprive the Filipinos of their patrimony, nor does it seem to have the moral courage to revoke the immigration laws without which the resources of the island can never be developed. Both of these basic economic issues are being characteristically side-stepped, the last under the provisions of a measure that will circumvent the immigration law by admitting foreign contract labor under restrictions and limited terms of employment. In other words, a revival of the obnoxious coolie trade which has recently been brought under the searchlight by a commission appointed by the Chinese government and condemned in the strongest language. Such a palpable evasion of the exclusion laws will fail to accomplish its purpose. It is a foregone conclusion that any Chinese government retaining a modicum of self-respect, will oppose any further extension of the coolie trade, no matter how well it may be regulated. The only straightforward and honorable way to meet this question is to annul the application of the American exclusion laws to the islands. This will have to come in time anyway, as a pre-requisite to recognition of an independent Filipino republic by its Asiatic neighbors.

If this is inevitable, then why wait for Filipino independence to terminate a situation that only strengthens Asiatic resentment against the American people ? Immediate repeal of our exclusion laws as applied the Philippines would convince the Japanese of our real friendliness and take the curse from our recent uncalled for action at home by opening an outlet for their capital and energies in Asia. If the Filipino people do not fear aggression on the part of Japan or object to the competition of the Chinese, and the admission of these people and their capital into the islands will stimulate their rapid industrial development and the creation of an economic foundation to their future political structure, then why in the name of common-sense and practical politics should America persevere in her stiff-necked attitude on this question.

Here we stand, faced with the possibility of immediate withdrawal from the islands if the democratic party emerges victorious in the coming elections, leaving our wards to build their own economic foundation to the top-heavy political edifice that we have been a quarter of a century in perfecting and which must crumble into a dust heap the minute independence becomes a fact and the islands bereft of the benefits of our tariff concessions. For it is folly to presume that independence will carry with it special tariff concessions that will further embarass the American taxpayer with the maintenance of a government which has been in such a hurry to escape from under our rule. Independence if it comes, should be absolute, without strings, and the Filipinos should be permitted to solve their own problems in their own way. If it must come, then it will be more charitable and philanthropic on our part to anticipate the event by the immediate rectification of a mistake that will at least permit our wards to prepare for their own economic welfare.

An independent Filipino republic will gradually drift further and further away from American influences and its destinies become interwoven with those of its immediate neighbors. More and more the political stability and economic prosperity of the Filipinos will be determined by their relations with other Asiatic peoples. If we are honest with ourselves and with our wards we can lay the foundation of a lasting good-will on the part of China and Japan towards the infant republic, by anticipating the inevitable and removing a barrier that now stands as a challenge and an insult to those on whose friendship rests to such a large extent the permanent success of our experiment in colonial government.

Labor's Utopia in the Philippines

Remarkable Success of Lenin's Principles as the Outgrowth of America's Philanthrophy

A New Angle to the Philippine Problem

AN American guardianship over an unwilling, ungrateful and generally cantankerous ward when stripped of all its glamor reveals the plain truth that our continued control over the Philippines is simply a matter of national politics, a conflict between commercial imperialism on one side and a more rigid adhesion to national ideals on the other. Our office holders, army and navy officials, big-business men, philanthropists and educators advance each in their own way and from the viewpoint of their own interests their specious reasons in support of a system wholly repugnant to the basic ideals of our national life, while the democratic party at every possible opportunity flatly advocates a return to our traditional outlook on the fundamental rights of a people to govern themselves, by immediate withdrawal from the Philippine Islands. The democratic party has lived up to its professed principles and under Wilson had nearly severed the tie that binds the islands to the United States. Once again, the democratic leaders declare their determination to get out of the islands by inserting this program in their party platform for the election of a new president.

The Philippine question has descended by rapid stages from a lofty conception of carrying the white man's burden to a partisan political squabble, with the "burden" kicking, biting, and insulting its carrier in its efforts to be unloaded and left where it is dropped.

It is not our purpose to review the Philippine question in its many ramifications but to invite attention to an entirely new viewpoint disclosed by the perusal of a recent expert report on the insular sugar industry. It has been generally admitted that the greatest obstacle to capital investment in the island is the state of political unrest due to the independence movement kept alive by native politicians. On the other hand, we are informed that the people as a whole are happy, prosperous and contented with American rule. If the report which follows is true, they ought to be.

THE FAR EASTERN REVIEW has consistently maintained a purely independent and critical attitude towards our Philippine problem and has invariably rejected the cant employed to justify our continued presence in the islands. We have held and will continue to hold that the main obstacle to the development of the resources of the islands is fundamental—*the Malay don't like work.* This is the key to the problem, yet instead of devising methods that might compel him to exert himself, Americans have done everything to encourage him in a state of semi-idleness. One of our first steps was to revoke the old Spanish law which compelled the farm laborer to work out the cash advances made by the planter in order to get him on the job ; we then extended our exclusion laws to the islands which kept out competition in the insular labor market and then indirectly, of course, we voted a huge subsidy from the national treasury which enabled him to exist in comparative idleness by contributing one hour's work in a twelve-hour day to the development of the principal insular industry. Analyzed in an unbiassed manner, our much vaunted experiment in the Philippines, the acme of altruistic disinterestedness in the government of a backward people, comes about as near to being an ideal application of Soviet principles as anything ever dreamed of by Lenin in the hey-day of his power.

We have before us the expert report of Mr. Arnold H. Warren on the Philippine sugar industry who prefaces his array of facts with the query—" is the Philippine sugar producer building his house upon sand ? " After a careful analysis of his facts which conclusively prove that the industry is dependent for its survival upon the American tariff, the answer to his question, is an emphatic—YES ! Some months ago we commented on this same situation pointing out that that the real prosperity of the islands was based on its sugar industry and this in turn constituted a free gift from the American people through the remission of duties that well might go to swell the treasury receipts and help pay our war debts.

Considerable emphasis is laid on the fact that our trade with the islands has increased 700 per cent. in the last twenty years yet a further analysis of these figures proves conclusively that the profits arising from this trade are offset more than four times by our annual remission of duties on one item of insular produce alone. For instance, the trade of the Philippines for 1923 totalled $202,-552,737, of which 65 per cent. was with the United States. In that year, the islands purchased $50,654,710 worth of American goods, which is all that we can rightly expect to make a profit on. A large part of this trade was in machinery and other supplies for the sugar industry. If we allow a liberal profit of ten per cent. on this trade, we have about $5,000,000 which went to swell our national economy, while on the other hand the American government remitted from its treasury about $20,000,000 of the taxpayer's money on sugar alone in order to make this profit possible. If this is not philanthrophy, we don't know what is. Deprived of this magnificent subsidy, the Philippine sugar industry would cease to exist. Even a material reduction in this preferential tariff to equalize the position of the Cuban planter, who has a much better claim to our generosity, would spell ruin to the Philippine industry.

Our contention that even with this free gift from the treasury, the Philippine sugar producer is barely able to cover the costs of planting and milling is supported by a comparison of manufacturing costs in other sugar-producing countries which show that the Philippines cost is 4.278 gold cents per pound against 2.274 in Cuba. The Cuban producer pays in addition 1.76 gold cents per pound duty, a very important contribution to our national revenues, which, added to his manufaeturing costs, permits him to land his product in the United States at 4.034 gold cents a pound, or one-quarter of a cent under the manufacturing costs of the Philippine planter. Our duty to the Cubans is almost the same as our obligation to the Filipino, and when it is considered that most of the capital invested in the Cuban industry is American, there is even a greater reason why charity should begin at home.

In seeking for a reason that will explain in part the abnormally high costs of production in the Philippines, we reluctantly come back to our old contention that the Malay won't work unless compelled to either by law or the urge to exist. Of course, this is a sweeping generality, qualified by many local conditions throughout Malaya, but our experience is that the statement holds good in any fair criticism of the Malayan peoples.

This statement is fully supported by the expert testimony of Mr. Hind in which he shows that the Java Malay who must work or starve does six times the amount of work performed by his Filipino cousin at one-half the wages, which reduces the field cost of labor in Java to about one-twelfth of the cost in the Philippines. It would seem from Mr. Warren's survey that if the costs of sugar production in the Philippines are to be materially reduced it can only come from increased yields (calling for irrigation and fertilizing) and greater labor efficiency. The only item which seems incapable of bringing to a higher state of efficiency is that of labor and we are satisfied after twenty-five years of close observation that this is practically impossible under present or future conditions in the islands. What is needed to make the Filipino field laborer efficient is the competition of the Chinese, but here our conception of duty to our wards forbids this. The entrance of Chinese and Japanese capital and labor into the islands would convert them in ten years into another earthly paradise contributing their stores of much needed tropical products to the markets of the world at prices that would materially reduce the mounting costs of existence.

Yet in order to intensify racial hatreds and hold the islands intact for their original inhabitants we extend to them our exclusion laws, teaching one Asiatic that he is better than another by barring out the very people who could develop their resources. The figures show that the United States is paying out of its treasury about $20,000,000 gold annually to maintain a basic industry in a dependency whose people according to the most expert investigators do six times less work at twice the wages than the same people do in the adjacent possessions ruled over by the Dutch. We have enacted laws which prohibit corporations from owning large tracts of land in the Philippines and justify this measure by declaring it was done to prevent greedy capitalists from grabbing the lands of the natives during our tenure of guardianship over their affairs. This is pure bunk and piffle. The beet sugar lobbyists in Washington will tell a different story. They, combined with the refiners and the Louisiana planters, forced the passage of this law to prevent American capital from developing a huge sugar industry in the islands that might in time menace their own favored position under our high protective tariff system. The only concession they would make to the islands was to permit the entrance of a limited amount of duty free sugar, originally placed at 250,000 tons. The labor unions then influenced congress to extend the Asiatic exclusion laws to the islands because in their opinion it would be almost impossible to prevent a Chinese resident of a dependency from free entrance into the metropolis. In order to preserve these fictions and establish our record as a high-minded colonizing power, we go further and remit the sugar duties, now amounting to about $20,000,000 a year, which Mr. Hind demonstrates in convincing words and figures, goes in large part to maintain a people whose favorite diversion is to frequent cock-fights and gamble away their earnings until sheer necessity forces them to seek manual labor long enough to provide the funds to keep them in another period of arcadian idleness.

Labor constitutes the largest item in the manufacturing costs of sugar, so if the Java product costs 2.73 gold cents a pound to produce against 4.27 cents in the Philippines, it can only be explained by the fact that the Java planter receives twelve times more work out of the identical type of field labor than his Filipino competitor. In other words, owing to American altruism and a determination to continue in business as an eleemosynary institution, we take from the pockets of the American people a yearly subsidy of $20,000,000 gold and hand it over to the Filipino planter and sugar manufacturer in order to maintain hundreds of thousands of native farm laborers who give one hour of work a day as against twelve hours on the part of their racial kinsmen in Java. And we go still further. We protect the Filipino farm laborer against all possible competition that might compel him to render an honest day's work in return for the highest daily wage paid in the Orient, by the application of exclusion laws which preserves his monopoly of the insular labor market.

This situation comes about as near to the principles underlying the Russian Soviet system as anything we know of. If Lenin could have taxed the rich or exacted an excessive export duty on some particular Russian product and handed over the proceeds to the peasants by paying them a full day's wage for less than one hour's work and then put up the bars against the entrance of other people into this worker's Utopia, the success of his system would have been assured. If our guardianship over the Filipino is to result in the extension of this system by increasing the sugar output of the islands to one million tons, entailing an annual present of $40,000,000 gold to the insular sugar industry, it is high time that we give the whole Philippine problem another once over and seriously consider the plank in the democratic platform which provides for an immediate getting from under a load which is diverting millions from the pockets of American laborers in order that their Malay brother may dwell in a Soviet paradise.

Is The Philippine Sugar Producer Building His House Upon Sand?*

By Arnold H. Warren, Accountant and Sugar Chemist

THE Philippine sugar industry is entering a period of rapid expansion. It has just emerged from a period of radical change in the processes of sugar manufacture. In 1918 over 80 per cent. of the Philippine sugar crop was muscovado; in 1922 over 80 per cent. was centrifugals. Nowhere in the world has a change from antiquated to modern methods of manufacture been effected so quickly. The change from muscovado to centrifugal mill is now nearly complete, but the Philippine sugar industry is now entering upon a new period of transition which promises to be of greater significance to the future welfare of the country than was even the change from antiquated to modern methods of manufacture. I refer to the present rapid expansion in the area devoted to cane culture and in the total volume of the sugar crop. During the thirty years ending with 1922 the total output of Philippine sugar had remained practicably stationary. The total volume of the Philippine sugar crop is now, however, increasing by such leaps and bounds that it has been predicted that within five years the total sugar production of the.e islands will exceed 1,000,000 tons. The following figures are significant:—

Total Sugar Produced in the Philippines

		Muscovado		*Centrifugal*		*Total*	
Crop		Piculs	Metric Tons	Piculs	Metric Tons	Piculs	metric Tons
1922-23	...	710,862	44,962	3,577,775	226,298	4 288,637	271,260
1923-24*	...	700,000	44,275	4,968,566	314,266	5,668,566	358,541
1924-25	...	700,000	44,275	6,666,210	421,644	6,366,210	465,919

*Muscovado Production for 1923-24 estimated, as final figures on muscovado production are not yet available.

Causes of Present Expansion

One cause of the present rapid increase in the sugar output of the Philippines is the relatively high price which Philippine sugar is able to command as a result of free entry into the American market under a high protective tariff. The operation of this cause is self-evident and requires no comment.

The mere urge of a favorable price alone would not, however, have been sufficient to induce the present rapid expansion of the Philippine sugar industry. There is a second and more imperative cause. The rapid change from muscovado to cenrifugal mills was effected during the period of war inflation. As a result the cost of erecting the new modern factories was abnormally high. With the sudden deflation of sugar prices which occurred in 1921 many, of the new factories found that the only possible method of securing a profitable return upon the capital already invested was to increase the initial capacity of the factory and at the same time to so increase the production of cane as to permit the factory to grind up to the limit of its new capacity.

Many of the planters also had accumulated a load of indebtedness on their haciendas so great that they could not pay the interest a charge let alone amortize the principal without very greatly increasing the yearly output of sugar cane from their haciendas.

*American Chamber of Commerce Journal.

Two means of increasing Philippine sugar production were available and both are utilized. One means was to increase the area planted to cane. The other was to increase the quantity of sugar produced per unit area.

In order to permit the planting of new areas to cane additional crop loans have been extended to the planters. The Philippine National bank has played a large, albeit somewhat unwilling, part in the extension of these crop loans. With around forty million pesos of its funds tied up in six centrals built during the period of war inflation, the bank, finding itself unable to withdraw from the sugar industry, has seized the other horn of the dilemma and now, by advancing additional capital for enlarging the initial capacity of the centrals and for extending the area planted to cane, hopes eventually to recover most, if not all, of the enormous sum which it now has tied up in the industry.

As a quick means of increasing the yield of sugar per hectare commercial fertilizer has been successfully introduced. During the past two years extensive field experiments have been conducted throughout the sugar-producing districts to determine the kind and quantity of fertilizer which would yield the maximum return on the money expended for fertilizer. As a result of these experiments the present fertilizer requirement of Philippine cane is now fairly well understood. The quantity of commercial fertilizer used in growing the 1923-24 crop of Philippine sugar cane probably exceeded 10,000 tons, and a considerably greater quantity is being applied to the 1924-25 crop.

Partly as a result of the use of fertilizer and partly as a result of favorable weather conditions, and more efficient methods of cane culture and modern methods of sugar manufacture, the average yield of sugar per hectare was close to 65 piculs for the 1923-24 crop as compared with an average yield of 34 piculs of sugar per hectare reported by the bureau of agriculture in 1918. The average of sugar per hectare of the Philippines is still less, however, than the yield of any other sugar-producing country.

Rank of Sugar Among Major Industries

Sugar has already for some years been the largest single item of export from the Philippines. And if the increase in sugar production continues at its present rate the value of the sugar exported will in less than ten years exceed the combined value of all other exports. The bureau of customs reports the principal exports from the Philippines for the calendar year 1923 as follows:

Article	Per cent. of Total Exports	Value
Sugar	29	P.69,038,246
Hemp	21	49,903,150
Copra	16	38,493,998
Coconut oil	10	28,133,164
Tobacco products ..	8	21,034,893
Total of all exports ..	100	P.241,505,980

The bureau of agriculture reported the total value of, and area devoted to the nine principal agricultural crops of the Philippines to be as follows on June 20, 1923 :

Crop	Hectares Under Cultivation	Value
Rice	1,675,870	P.149,475,950
Sugar Cane	227,290	87,831,550
Coconuts	456,440	64,366,220
Hemp	513,420	39,317,490
Corn	557,690	32,388,700
Tobacco..	64,730	6,814,800
Totals for 9 principal crops..	3,526,205	P.385,143,280

Capital Employed in Philippine Sugar

Exact statistics as to the total amount of capital employed in the Philippine sugar industry are not available. The following estimate prepared by the writer is drawn from various sources of information :—

Capital employed by sugar factories	P.130,000,000
Capital value of land, including farm buildings, equipment, and livestock employed in cane culture (227,000 hectares at P.700 per hectare)	158,900,000
Capital invested in the growing crop of cane (7,000,000 piculs at P.3 per picul)	21,000,000
Capital employed by sugar merchants in buying and selling sugar in the Philippines (excluding that included in previous items)	10,000,000
Estimated total capital employed in Philippine sugar industry	P.319,900,000

The above estimate covers only the capital directly employed in the production and marketing of sugar. There is, of course, a large additional body of capital employed : by merchants selling supplies and equipment to those engaged in the sugar industry, by machine shops and foundries devoted to the manufacture and repair of sugar mill machinery, by railroads and interisland vessels engaged in the movement of sugar, and of supplies, and of equipment required by the sugar industry. It is impossible at present even to estimate the aggregate amount of this large additional body of capital which is dependent for a profitable return upon the continuance and prosperity of the Philippine sugar industry.

Cost of Producing Philippine Sugar

It is only within the last year or two that accurate data as to the average cost of producing sugar in the Philippines has been available. In any consideration of the Philippine production costs it is essential to remember that in the Philippines production of sugar is a partnership undertaking in which two parties—the planter and the sugar factory—are jointly engaged. Furthermore although it is a joint undertaking the two parties do not share and share alike in either the cost of production or in the division of the product. Neither party, however, can succeed without the other. If the planter cannot produce cane at a profit the central will not be supplied with cane for the manufacture of sugar. And if the central cannot manufacture sugar at a profit the planter will have no means of converting his cane into a marketable product.

Any intelligent analysis of Philippine production costs must therefore include a consideration of the cost both to the central and to the planter ; and obviously it is cost to the party which works upon the narrowest margin, which is the determining factor in the success or failure of the industry. The cost of sugar production to the Philippine planter.

Under present conditions it is the planter who works upon the narrowest margin. It is the cost of production to the planter, therefore which must be given the most serious consideration.

Probably no one is better qualified to speak upon the subject of the cost of production to the Philippine planter than Carlos Locsin. Mr. Locsin is both a sugar chemist of repute and a successful planter. Mr. Locsin has recently published (Sugar News for September 1924) what is probably the most authoritative statement of the cost of sugar production to the Philippine planter.

Mr. Locsin finds the cost of production to the planter to vary according to the yield per hectare. He gives the cost for yields varying from 50 to 120 piculs of sugar per hectare. Furthermore, since the centrals and the land owner each secures a fixed percentage (45 per cent. to the central and 12 per cent. to the landowner) of the total sugar produced, the manufacturing cost to the planter on his share (43 per cent.) of the sugar varies according to the selling price of the sugar. Mr. Locsin's calculations assume a selling price of P.12 per picul ex centrals warehouse.

Mr. Locsin's method of calculation assumes that the planter in effect buys the central's and the landowners' shares of the sugar at the selling price of the sugar, and then sells all of the sugar produced at the same price as he paid.

COST IN PESOS PER PICUL OF THE PLANTERS SHARE OF THE SUGAR PLACED IN THE WAREHOUSE AT THE CENTRAL WHEN THE SELLING PRICE OF THE SUGAR IS P.12 PER PICUL.

(*Calculated by Carlos Locsin*)

Item—	*Total Yield of Sugar in Piculs per Hectare*							
Paid to Central for	50	60	70	80	90	100	110	120
	P.	P.	P.	P.	P.	P.	P.	P.
manufacture of sugar	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5 40
Rent paid landowner,	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Planting, cultivation, etc.	3.00	2.50	2.14	1.88	1.67	1.50	1.36	1.25
Cost of fertilizer ...	...	...	...	.81	.72	.65	.59	.54
harvesting expense	.80	.80	.80	.80	.80	.80	.80	.80
Depreciation of buildings, implements and livestock	1.00	.83	.71	.63	.56	.50	45.	.42
Totals	11.54	10.97	10.49	10.96	10.59	10.29	10.04	9.85
Add interest on crop loan	.38	.33	.29	.33	.30	.28	.26	.24
Total cost of production	12.02	11.30	10.78	11.29	10.89	10.57	10.30	10.00

The above method of calculating the cost of production to the planter is inconvenient in that the figure obtained for the cost is not constant for any given crop but varies with the selling price of the sugar.

It is evident that in the production of any given crop of cane the planter must have been put to a definite and fixed outlay which is entirely independent of the selling price of his sugar. It should be possible therefore to apportion this total outlay to his share of the sugar and so determine directly without reference to the selling price of the sugar the cost to him of each picul or (pound) of his share of the sugar.

Mr. Locsin's table evidenly gives the various items of field cost in pesos per picul calculated on the total yield of sugar (including the central's share and the landowners' shares). The central's share is 45 per cent. of the total and landowner's share is 12 per cent. of the total. The planter's share is therefore 43 per cent. of the total. The field cost per picul of the planters share may therefore be obtaineddividing the figure given in Mr. Locsin's table by 0.43 as follows :

CALCULATION OF FIELD COST PRODUCTION OF THE PLANTER'S SHARE

(*Yield 60 piculs per hectare*)

	Pesos per picul	Cents gold per lb.
Planting, cultivation, supervision (2.50÷.43)..	P.5.81	2.083
Harvesting expense (.80÷.43)	1.86	.667
Depreciation of buildings, implements, and livestock (.83÷43)	1.93	.692
Total	P.9.60	3.442
Add interest on crop loan (.33÷.43)	.77	.276
Total cost of production ex centrals' warehouse..	P.10.37	3.718
Add marketing expense	1.46	.560
Total cost of production ex steamer New York	P.11.83	4.278

Cost of Sugar to Factory

The cost to the Philippine centrifugal factory of producing its share of the sugar is more than one cent gold per pound less than the planters cost of production. The following figures are taken from a report on the factory production costs published on page 151 of the "Compilation of First Committee Report for the First Annual Convention of the Philippine Sugar Association, October 6. 12 1923:"

Cost of Sugar Manufacture to the Philippine Factory Receiving 45% of Total Sugar Manufactured 1922-23 Crops

	Cents gold per lb.
Transportation of cane	.32
Manufacture	.33
Administration and general expense	.22
Total	$0.87

In the issue of Facts About Sugar for July 12, 1924, is published a summary of a report showing the average cost of production for 28 Javan factories producing 12 per cent. of the total Javan sugar crop of 1923. The average cost of production for these 28 factories is reported as 2,936 cents gold per pound. No details of the various items of cost are given, and the average polarization of the sugar produced is not recorded, but it may reasonably be assumed that the average polarization of the product of these factories corresponds very closely to the average polarization of the entire Javan crop. It may also be assumed that the average cost of producing 96.5 degree sugar bears the same ratio to the average cost (2.936) of producing all the sugar as the average selling price of 96.5 degree sugar bears to the average selling price of the entire crop. Calculated in this manner the average cost of producing 96.5 degree sugar would be: 2,936 by 0.93035=2.7315 cents gold per pound.

It is realized that this figure may not be exact, but is the best figure which can be arrived at from the available data.

The cost of cane is not reported separately by all of the twenty-eight factories. But the figures reported show a variation in cost of cane between 0.87 and 1.42 cents gold per pound of sugar produced. Taking the average of these figures the approximate cost of cane in Java may be put at 1.15 cents gold per pound of sugar produced. The average cost of production in Java for the 1923 crop was then about as follows for 96.5 degree sugar:

Average cost of producing 96.5 degree sugar in Java-1923 crop in cents gold per pound.

Cost of cane	1.150
Manufacturing cost	1.581
Total cost of production	2.731

Philippine Costs Compared with Costs in Other Countries

For purposes of comparison the results of the previous calculation as to the cost of producing sugar in Cuba, Java and the Philippines are tabulated below:

Costs of Producing Sugar (Expressed in Cents Gold Per Pound)

	Cost of Cane	Manufacturing Cost	Marketing Expense	Total Cost
Cuban factory	0.91	1.13	.234	2.274
Javan factory	1.15	1.581	..	2.731
Philippine factory	1.07	1.57	.56	3.200
Philippine planter	2.045	1.673	.56	4.278

Marketing expense is not shown separately in the case of the Javan factory. The manufacturing cost to the Philippine planter is calculated as 45 per cent. of the total cost of production to the planters (exclusive of marketing expense). Likewise the cost of cane to the Philippine factory is calculated, not from the selling price of the planters share of the sugar, but as 55 per cent. of the total direct cost of production to the central (excluding depreciation and marketing expense).

In comparing the costs given above it should be remembered that both the cost figures given for the Philippine factory and the cost figures given for the Philippine planter are probably somewhat below the average cost of sugar production in the Philippines to-day.

The figures given for the Philippine factory represent the cost of production in one factory only, and that one of the largest and best managed. There are many small factories in the Philippines to whom the cost of production is undoubtedly higher. Furthermore these figures do not include interest on the capital invested in the central properties. Many Philippine centrals were erected at an abnormally high cost with borrowed money during the period of war inflamation. These centrals are necessarily burdened with a staggering load represented by the interest and amortization of their indebtedness.

The cost figures given for the Philippine planter probably fairly represent the cost of production for the most successful planters. There are certainly many planters, however, for whom the cost of production is much higher.

The chief causes of the present high field cost of producing sugar in the Philippines may be itemized as follows:

1. *Extremely low yields of sugar per hectare.*—The average yield of centrifugal sugar per hectare for the 1922-23 crop was only 57 piculs. The average yield for the 1923-24 crop, partly as a result of the use of fertilizer and partly as a result of more favorable weather conditions is probably not less than 65 piculs per hectare, although final figures are not yet available. Even this figure is, however, much lower than the yield of any other sugar-producing country. The following comparison of yields is illuminating:

Average yield of sugar for some of the principal sugar-producing countries (expressed in piculs per hectare):

Hawaii	197.00
Java (1923)	173.00
Cuba	88.00
Philippines (1922-23)	57.00
Philippines (estimated 1923-24)	65.00

Within certain limits the Philippines yield can be and is being increased. The increase of yields is of necessity, however, a slow process of evolution in agricultural methods; and it is extremely doubtful whether Philippine yields will ever even approximate the high yields obtained in Hawaii and Java.

2. *Failure of cane to ratoon successfully in the Philippines.*—In Cuba the relatively low yield of sugar per hectare is more than offset by the extremely low cost of field operations. The extremely low cost of field operations is in its turn due to the marvelous power of Cuban soil and climate to produce ratoon crops of cane year after year with practically no expenditure for cultivation. As a rule from ten to twenty crops of cane are produced from a single planting.

It is the failure of Philippine cane to produce ratoons which is one of the principal reasons for the high field cost of productions. At present not more than one crop of ratoons, and that as a rule a very poor crop, is produced in the Philippines. This means that the land must be thoroughly plowed, harrowed and replanted at least every two years. In Cuba this operation is not repeated oftener than once in every ten years.

It remains to be seen to what extent a modification in cultural methods or a selection of new varieties of cane will improve the ratooning quality of Philippine cane.

3. *High cost and low efficiency of field labor as compared with other Oriental sugar-producing countries—Java, for example.* In Java the cane is not allowed to ratoon, but is replanted every year, government regulation concerning the rotation of crops and the production of rice requires this. But the enormous amount of field labor involved in the yearly replanting of the cane is more than offset by extremely high yields of sugar per hectare and by the extremely low cost of field labor in Java.

Java with its dense population has a huge surplus of field labor. Furthermore, because of the dense population, the Javan laborer cannot survive (as can the Philippine laborer) with little effort upon the natural products of the country. As a result the Javan laborer (according to figures given by R. Renton Hind in the September, 1922, *Sugar News*) not only receives less than half the daily wage, but does more than six times the amount of work of the Philippine field laborer. Or in other words Javanese field labor costs about one-twelfth the cost of similar field labor in the Philippines. When it is considered tha field labor represents considerably more than half the field cost of producing Philippine cane, the effect of the high cost and low efficiency of Philippine field labor in boosting the cost of sugar production is obvious.

It is extremely unlikely that the present daily wage of Philippine field labor will ever be materially reduced. Certainly it cannot even approximate the low wage paid Javan labor. It is possible,

however, that the amount of work which the Philippine laborer performs in return for his daily wage may be considerably increased.

4. *Prevalence of rinderpest and other epidemic diseases which continually decimate the work animals employed in cane culture.*—The basic source of power for agricultural operations in the Philippines is the work animal—*carabao* and *vaca*. The supply of work animals is kept continually below the demand, and the cost of replacement is kept abnormally high, by the heavy annual loss of animals by epidemis disease—principally rinderpest, anthrax, and hemorhagic septicemia. Furthermore not only is the planter's annual expenditure for work animals made abnormally high, but he is always liable suddenly to lose his animals at the time when they are most essential for his cultural operations. In times of epidemic immediate replacement of the animals lost is impossible because quarantine restrictions, if for no other reason. The disastrous effect upon the cane crop of sudden stoppage of essential cultural operations is obvious.

A serious attempt has been made during the past four or five years to substitute tractors for work animals in the production of sugar cane, but for many cultural operations the tractor has been found more expensive and less effective than the work animal. At present the use of the tractor is limited to preparation of the soil prior to planting.

Industry Dependent for Survival Upon Tariff

The candid observer is compelled to admit that with the cost of sugar production in the Philippines what it is at present the Philippine sugar industry cannot survive without the aid of an American protective tariff. Yet the present uncertain political situation makes the sudden withdrawal of such aid a serious possibility which the Philippine sugar producer is forced to consider.

The Philippine planter is making every effort to reduce and is reducing, his cost of production; irrespective of the political uncertainties of the future, any reduction in the cost of production is of immediate benefit because it correspondingly increases his profits. The process of reducing the cost of production is, however, necessarily slow, and the Philippine sugar producer can only hope that whatever change may come will not come suddenly nor too soon. Even a material reduction in the present extremely high American protective tariff would spell partial disaster to the Philippine sugar industry. It has been shown that the cost of production to the Philippine planter is at least two cents gold per pound higher than the cost of production in Cuba. The present American tariff on Cuban sugar is only 1.76 cents gold per pound. Hence Philippine sugar is already at a disadvantage in competing with Cuban sugar in the American market. The position of the Philippine producer would therefore be seriously jeopardized if the present tariff of the United States were materially reduced, to say nothing of this protection being entirely withdrawn.

Shanghai, The Future Metropolis of China

A Dream Whose Realization Depends Upon Harbor Facilities

THE development of Shanghai's harbor into an up-to-date deep water port is at the best, a depressing subject. What is now the first port of China, the distributing point for the vast Yangtze region, would probably have remained in the same category as Tientsin, Foochow, Antung or any of the other third rate coast ports if the Chinese had been permitted to have their own way. The development of the port of Shanghai to its present proud position was made possible solely by stipulating that its improvement be undertaken as one of the penalties imposed upon China for the Boxer outbreak of 1900. The protocol of this memorable document has been shot so full of holes that the major principles underlying it have been lost sight of in an epidemic of philanthropic insanity on the part of the powers to remit the cash penalties imposed as indemnities, overlooking that the obligation to pay was the only weapon they could effectively weild to force China to live up to her other committments under the treaty. The folly of such altruistic diplomacy is evidenced in the present condition of the port of Shanghai and the studied indifference on the part of the Peking government to any scheme that will enable the port to discharge its functions through further improvements.

The Boxer protocol provided for the creation of what is now known as the Whangpoo conservancy board, a technical body directed by expert foreign conservancy engineers, to whose labors are due whatever prominence Shanghai now enjoys as a deep-water port of call. The work of this commission has been confined to the improvement of the tidal river whose name it bears, nursing, coaxing and forcing the current to dig its own channel, scour its mud banks and bars and maintain a navigable depth of water. This work has been carried out with unusual efficiency but it has its limits. With the coming of larger and deeper draft vessels the position of the port became dependent upon the improvement of its Yangtze approaches and the creation of a larger port either at Woosung or some other favorable point. This fight with the forces of nature called for the most serious thought of the best experts in river conservation and in order to obtain this advice, the Whangpoo conservancy board induced the Chinese government to invite an international commission of experts to study and devise plans for the solution of the problem. It is now three years since this committee of consulting engineers composed of seven of the foremost and most experienced experts on port development and conservancy in the world, submitted its report and recommendations. The feature of the report was its financial feasibility, whereby the whole of the work would be self-supporting without any drain on the Chinese government finances. (The full report of this commission appeared in THE FAR EASTERN REVIEW for February 1922). The report was duly forwarded to Peking, since when, nothing more has been heard about it. It has been pigeon-holed or buried in the musty archives of some bureau from where it will be resurrected a century hence for the edification of a future generation of Chinese as evidence of how their ancestors outwitted the foreigner. About the only chance the further development of the port of Shanghai may have, in our opinion, will depend solely upon concerted action of the powers, and here, mutual jealousies and bickerings, intensified since the entrance of the Soviet into the Peking diplomatic family, will effectively operate to prevent harmony.

Absorbed in its own preoccupations, the commercial community of Shanghai ignores the trend of events which is slowly but surely undermining the position of the foreigner and restoring to China her sovereign rights. Settlement extension is strenuously opposed and it is difficult to believe that the Chinese authorities will consent, except under force, to any scheme which tends to strengthen rather than diminish the hold of the foreigner on the principal port of the country. The fact that China will benefit by these improvements to a greater extent than the foreigner is an argument which carries no weight with the Chinese. We would like to believe that the scheme will be sanctioned by Peking, but the signs of the times dispel such illusions. There is only one thing that will save Shanghai from following the fate of Antwerp and sinking to the level of a fifth rate port and that is energetic and united action on the part of the powers. Under present conditions, such a solution seems a hopeless one, for the only lever that could have induced the Chinese government to act promptly on the report of the expert commission has been gratuitously surrendered in response to the continuous propaganda on the part of professional philanthropists to have the remitted Boxer indemnity set aside for the advancement of their own special interests. That this is so, the commercial community of Shanghai have only themselves to blame, for they have remained quiescent while the philanthropists and their propaganda agents have moved heaven and earth to deprive them of the only guarantee that the higher interests of the port would be given consideration.

It may be that Chinese gratitude will be stimulated by the remission of the Boxer indemnities for educational purposes; it may be that the masses of China will be uplifted and immeasurably benefited through this gesture of philanthrophy on the part of the powers, but we are confident that their gratitude will never find expression in any further impairment of their administrative independence for the advancement of foreign trade. Every foreign nation looks forward to a wonderful development of its commerce with China. Especially is this true of the United States. The thought occurs to us, however, that if China has no port with the facilities for handling this increased volume of trade, and the realization of our dreams depends upon the enlargement of Shanghai's harbor, the time will arrive when pressure will have to be brought to bear on Peking to carry out the scheme recommended by the international commission, or the foreigner, in order to continue in business, will have to accept whatever conditions China is willing to concede.

The wonderful future of Shanghai painted in glowing colors by local scribes is merely a castle in the air, a mirage conjured up by publicity optimists which fades away before the cold light of every day facts. Realization of the dream metropolis on the banks of the Whangpoo must rest on the solid foundation of a port large enough to make the dream come true. And for lack of far-seeing leaders interested in this great future, the foreign commercial community of Shanghai have seen their vital interests ignored, if not sacrificed altogether in order to satisfy the propaganda created demand for education. It is high time that the important commercial interests of Shanghai awoke to a realization of where all this is leading. The federation of British industries has shown them the way and if reinforced by the recommendation of the British chambers of commerce in China it may not be too late to tie some kind of a string to the British portion of the Boxer indemnity that will work out for the benefit of Shanghai. If the Chinese government can be induced to approve the scheme for the improvement of Shanghai's harbor, the British alone can bring the required pressure to bear while they still retain control of the only persuasive argument to which the Chinese will listen.

Our local community has been regaled for the past year or so with considerable publicity about Anglo-American harmony in all matters which concern foreign interests in China. This is most commendable and praiseworthy. We make the terse comment, however, that such co-operation is confined to a very limited group of enthusiasts. The American government, it is true, may support the British in some diplomatic note urging China to consider the matter of Shanghai's harbor enlargement. The American community in Shanghai may also support such a demand, but after all is said and done, their co-operation in such a matter, now that their share of the indemnity is surrendered, will have little force compared with the more persuasive British argument. In the last analysis, the future of the port of Shanghai rests with those whose energy, initiative and capital have been largely responsible for its development into its present proud position. The British alone can make the dream come true.

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"Grave Consequences"

If Bishop Reifsnider of Tokyo is to be believed, then we have to record one more instance where the usefulness of Japanese diplomats has been destroyed by the somewhat inexplicable diplomacy of the American state department. In an address before the Tokyo rotary club on his recent return from the United States, Bishop Reifsnider declared that "the phrase 'grave consequences' in Ambassador Hanihara's note was inserted at the instance of Secretary Hughes, who, when shown a first and milder copy of the protest, requested the Japanese ambassador to 'put teeth' into the note."

"The phrase 'grave consequences' was pounced upon by Senator Lodge, republican floor leader of the senate, who was angered because Secretary Hughes had requested the Japanese ambassador to write the note to be sent from the department of state direct to congress, without having it first referred to the foreign relations committee of which Senator Lodge is chairman, and because, in addition, Senator Lodge is not on good terms with President Coolidge and desires to embarrass him."

The story has not been denied. Bishop Reifsnider undoubtedly spoke the truth when he divulged the inside story of how Ambassador Hanihara was made the "goat" of American politics. "Hani," the most popular ambassador Japan has ever sent to Washington, realizing that his usefulness was finished, demanded to be recalled and since his return to Tokyo has announced that he will retire from diplomatic life.

In the same manner, Secretary Lansing destroyed the usefulness of Viscount Ishii and made his further presence in Washington untenable over the matter of the appointment of a financial adviser to the Chinese government. The Chinese and Japanese desired the appointment of Baron Sakatani for this post, but before taking any action, Ambassador Ishii, acting under the instructions of his government, approached Secretary Lansing to ascertain if the American government would oppose this selection. Mr. Lansing stated that his government had no objection to the appointment, and on the strength of this, Ishii cabled Tokyo to that effect and the appointment of Sakatani was publicly announced. The fireworks then started in Peking. Minister Reinsch kept the cables hot telling Washington how American acquiescence in the appointment of a Japanese financial adviser to the Chinese government would be construed as a recognition of the doctrine of Japan's special interests in China, and other arguments which found credence in those days. Minister Reinsch protested the appointment and raised such a stink over the affair that the Japanese government found itself in a most embarrassing position. Secretary Lansing disclaimed ever having given any assurance to Viscount Ishii, thus completely destroying his further usefulness at Washington, making necessary his recall and the appointment of a successor. Bishop Reifsnider's disclosure would seem to be another instance of where a Japanese diplomat has been retired through the vagaries of American statesmanship.

* * *

Six Months Prisoner—A Review

Not only as a human document is Mr. Elly Widler's "Six Months Prisoner of the Szechuen Military" of importance to the observer of China and things Chinese, but coming just at this time when pleas for the abolition of extraterritoriality are rising from the Chinese on all sides, the book is worthy of close study. The author tells a plain unvarnished tale, disclaiming literary ability, in the desire to get his story before a public that knows next to nothing of the contacts between Chinese of the dominant military class and the foreigner who is isolated in some port far from the legation quarter to which reports of occurrences, such as Mr. Widler outlines, filter very slowly and sometimes never reach the diplomat at all.

For several months Mr. Widler endured the discomforts of a Chinese jail, cold and hunger his daily portion until the work of influential friends began to shake the confidence of the Chinese in their ability to hold a foreigner prisoner indeterminately, and as sudden as was his arrest, came the order for release. Many interesting sidelights are cast upon Chinese customs, especially those that prevail in prison and much of human interest accompanies the prisoner's tale of his sufferings. The book is not in the least harrowing and has many droll touches in depicting various men and events. Not only Mr. Widler, but various writers in the public press, comment on the disinclination of the Chinese to permit investigation of their admirable (on paper) penal code which afforded the victim of Chinese tyranny no relief, no trial and treated him as did the feudal lords of the XIII century their prisoners. As a comment on the inadvisability of abolishing the extraterritorial rights of foreigners to be tried by their consuls instead of falling under the tender mercies of a Chinese (so-called) court, the book is worthy of wide circulation.

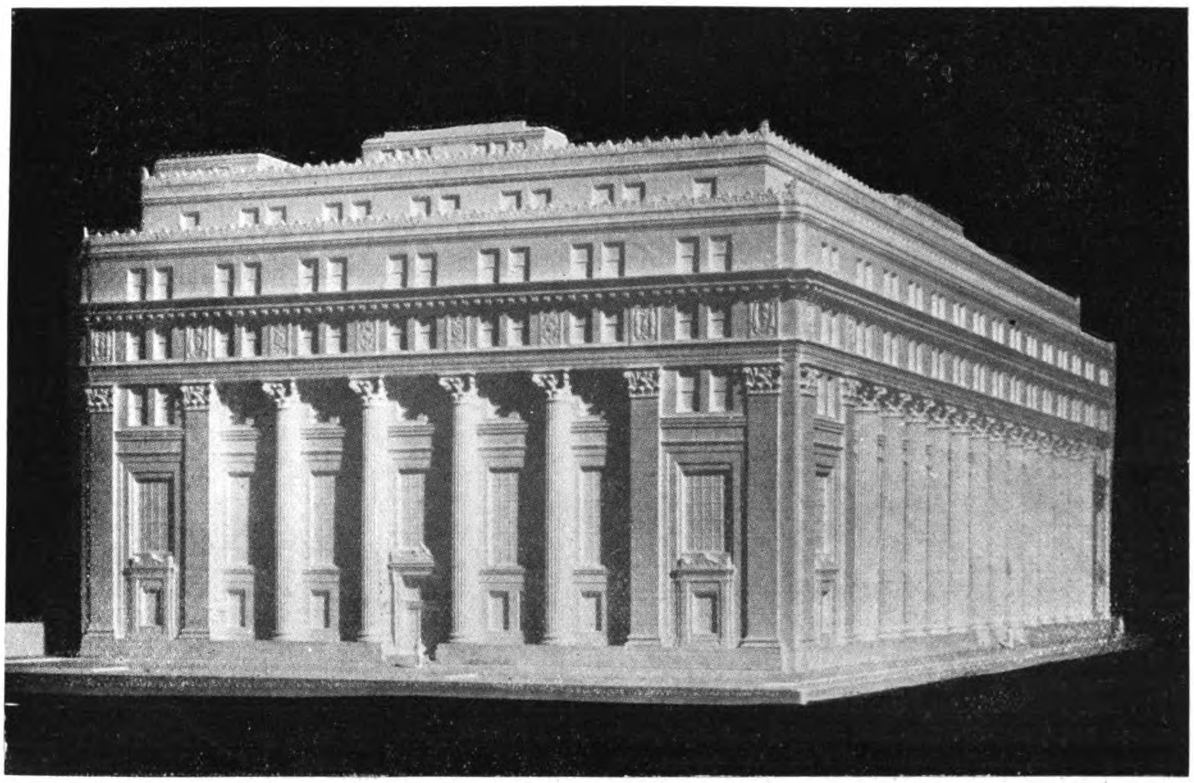
Japanese-American Co-operation

Established on a Firm Basis

Expanding Markets for American Materials

A Vicious Misrepresentation

ONE of the brightest outlooks for the expansion of American trade and engineering practice in Asia is the remarkable increase in American co-operative enterprises in Japan, not only in the matter of loans but in the equally if not more important fields of engineering and industry. Before taking up the main subject of this article, we desire to correct a statement now going the rounds of the anti-Japanese press in regard to the use of the American loans to Japan. In a recent number of THE FAR EASTERN REVIEW we invited attention to the total amount of American loans to Japan during the past year, aggregating some $212,000,000. The bulk of these funds ($150,000,000) went to pay for reconstruction material purchased in America. At least half of the Daido Electric Power Company's loan of $30,000,000 also went to pay for American electrical machinery, the balance, to retire outstanding indebtedness.



Architect's Model of the New Mitsui Building to be Erected in Tokyo

The Oriental Development Company's loan of last year amounting to $10,000,000 has been expended almost exclusively in the legitimate activities of this company in Korea, while the recent issue of $22,000,000 to the Industrial Bank of Japan has been used for the general business of the bank and although not stipulated or admitted, it is currently assumed that this loan has enabled the bank to carry its obligations and protect the Japanese bondholders of certain defaulted Chinese government issues which come under the general head of the so-called Nishihara loans. As far as we have been able to discover, not one cent of these American loans has been diverted to uses outside of Japan. Yet anti-Japanese writers in China would make it appear that the bulk of these loans has been used in some manner not specified to advance Japanese interests in China. If these anti-Japanese writers could understand that Japan has invested several billions of yen in legitimate enterprises in China and which brings them in less returns than if the money had been permitted to draw interest in a Japanese bank at home, their common sense would tell them that Japan at this particular period is not throwing good money after bad. Aside from the new capital required to finance the legitimate enterprises of the South Manchuria Railway Company and a few private industrial plants scattered throughout China, the Japanese are keeping their money at home. Instead of using the American loans to compete with or close the door to American opportunities in China—opportunities we have never taken advantage of—the Japanese are loyally playing the game, reciprocating by doing everything within their power to encourage further co-operation by employing the best American technical talent for the reconstruction and remodeling of their major industrial establishments and municipal improvements.

Fuller Company's Activities

It is only necessary to mention a few instances to support this assertion. When the great Mitsubishi interests determined to erect several modern steel office buildings in the heart of Tokyo's business district, they called in the Geo. W. Fuller Company of New York, and formed an American-Japanese construction company to undertake the work. As a result of this step, American building methods have obtained a firm foot-hold in Japan, assuring to American manufacturers the major part of the orders for modern steel construction materials as well as the many side lines of builder's hardware. To the several handsome office buildings erected by the Fuller Company of the Orient in the business centre of Tokyo, they are now completing for the South Manchuria Railway Company at Dairen the finest hospital in Asia, barring none. Not even the famous Rockefeller Institute at Peking can outdo it in the completeness of its fittings and the modernity of its interior design. There are other large modern buildings now being planned by the S. M. R. Company for erection in Manchuria and there is every possibility that the same American-Japanese construction company will secure the contract. This has introduced modern American building methods into China on a scale that otherwise would have been difficult for Americans to carry out. The Dairen hospital will stand before the Chinese as an example of American construction that will have the same advertising value for our building methods as the American equipped S. M. R. has had on engineering specifications in China.

The great Mitsubishi interests of Japan have combined with the Westinghouse Electric Manufacturing Company to form an American-Japanese enterprise for the manufacture of electrical machinery in Japan and a huge modern plant is now in course of erection. It will also be built to standard American specifications.

Truscon Steel Construction

The Truscon Steel Company of America has combined with Japanese capital, in the formation of an American Japanese company

to handle its products in Japan and has been eminently successful in extending American reinforced steel and concrete construction in that country. Many of the handsome buildings and new industrial plants in the course of erection in Japan are being built to their specifications. We have published in a previous number of THE FAR EASTERN REVIEW, the particulars of the contract awarded to the Stauart Company of New York for the erection of the great Mitsui building which will cover a square block and house all the various offices of the numerous Mitsui activities.

Foundation Company in Japan

Another leading firm of American engineers encouraged by the prospect of obtaining the contract for constructing the subway system for Tokyo has also started business in Japan.

The Foundation Company of New York has now secured several contracts for important reconstruction work in Tokyo, amongst which are the piers for the first two of the five projected new bridges which are to span the Sumida River as part of the Greater Tokyo reconstruction plan. The two bridges whose piers are to be built by the Foundation Company will be 579 feet in length and besides the piers at each end will have two piers in the river. The steel work for the bridges will be constructed in Japan. In building these piers the contractors will have to go down perhaps 100-ft. to find a firm foundation, necessitating the use of the pneumatic system in excavating. The contract provides for their completion in ten months after work starts. The cost of the two bridges will approximate Y.2,000,000.

The H. K. Ferguson Contract

On the outskirts of Yokohama, the first unit of the new works of the Shibaura Engineering Works is nearing completion, another huge Japanese industrial plant going up on purely American lines. This company, closely affiliated with the great Mitsui interests is associated with the General Electric Company of America in the manufacture of electrical machinery and appliances of all kinds and is the largest manufacturer of these products as well as industrial machinery and machine tools in Japan. The old plant at Shibaura, a familiar sight to all who travel between Tokyo and Yokohama, was found too small and scattered to be efficient, and in order to handle the constantly increasing output, the company decided long before the earthquake to erect a complete new plant on a new site. These plans provide for two units of five buildings each, covering a total floor space of five acres per unit, each building being 900 feet long by 300-ft. wide. The plant is designed to provide for the same type of quantity production as is typical in the larger factories of America, a system that will tend to increase efficiency and lower the cost of production in Japan and permit the products of the Shibaura Works to enter into a more active competition for Chinese requirements.

The erection of this up-to-date plant was entrusted to the H. K. Ferguson Company of New York, whose vice-president, Mr. J. S. Ruble, has been in personal charge of the designing and erecting work. This contract is considered as another victory for American methods in Japan and exemplifies once more the close friendship of the Mitsui interests for America.

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Asiatic Consumption of Western Staples

A New Factor in Economics

BRITISH woolen manufacturers are congratulating themselves on the development of new markets for their products in China and Japan which last year became the largest purchasers of British woolens. In seven months of this year, China has purchased 14,028,000 square yards against 6,576,000 in 1913. Japan, which eleven years ago took, 7,661,000 linear yards has in the past seven months taken 17,683,000 square yards. Between them these countries have purchased nearly a third of British shipments of woolen piece goods, in addition to some 7,892,000 square yards of worsted cloths, or close upon a quarter of the total worsted exports from Great Britain.

This new tendency in world trade will have its effect upon prices at home and make things dearer for the American and European consumer. There is little doubt of the wonderful possibilities in world trade if the peoples of China and Japan adopt the same dress and eat the same food as the Occidental. For instance, if the Japanese should become beef, instead of fish eaters, the increased consumption in the east would send the price of beef soaring skyward in the west. If the Chinese should follow suit, we would probably have to seek for some new food to take its place. If these peoples take to wearing foreign shoes where will the hides come from to furnish the material for another 500,000,000 to a billion pairs of new shoes each year ? What will this tendency have on the price of shoes to the people of the west ? The same applies with equal force to many other staples and articles of every-day use.

Increased sales of woolens to China and Japan will depend largely upon prices low enough to enable these thrifty peoples to buy, a difficult task when the world's wool clip for the next two years is likely to fall short. If the demand from the Orient continues, it means that the cost of woolen suits in America and Europe will go up while New Zealand and Australia will benefit by the increased price of wool and expand their purchasing power.

In a similar manner, the new demand for woolens and other occidental necessities synchronizes with the rapidly increasing taste of the Chinese and Japanese for wheat flour. This will make wheat dearer for the peoples at home until Siberia, Russia and Manchuria are once more brought under full cultivation. Last year, the Japanese consumption of wheat was 83 per cent. higher than it was ten years ago and most of the 31,500,000 cwts. the Japanese bought came from Australia. China, too, in nine months has purchased 2,000,000 cwts. from Australia. The dominant feature of China's imports during the first quarter of this year, aside from its purchases of British woolen goods, was the rapid increase in the purchases of foreign flour amounting to more than 2,185,000 barrels, a striking contrast to the 745,000 barrels imported during the same period of last year. The bulk of the flour imported into China comes from America and made China for the period mentioned, the largest world market for American flour. Thus, we have two new mouths to feed with wheat bread at a time when Russia's export is likely to be less than it was last year, and when the American and Canadian exportable surplus may be 5,000,000 tons below that of last year. That means dear bread somewhere else in the world but increased prosperity for Australia and New Zealand.

New Dredge for Basra

Messrs. Wm. Simons & Co., Ltd., Renfrew, launched on September 2, the cutter suction hopper dredger *Liger* which they have constructed for the Anglo-Persian Oil Co., for work at Basra.

The dredger has been constructed under the direction of Messrs. Rendel, Palmer and Tritton, consulting engineers, London.

The vessel is fitted with two sets of triple-expansion surface-condensing engines, and steam is supplied by two cylindrical multitubular boilers, fitted with forced draught and oil-burning installation.

The dredging outfit consists of a set of triple-expansion engines, driving a centrifugal pump, coupled to a suction pipe, fitted in a frame carrying a cutter, designed for disintegrating compact material, the cutter being driven by gearing from an independent set of compound engines. The suction frame is designed to dredge to a depth of 40-ft. under water, and arranged to take a drag suction nozzle when required. "Simons" patent suction keelsons are fitted to the hopper, so that the load may be discharged overboard through a floating pipe line, in addition to the usual bottom discharge by means of doors.

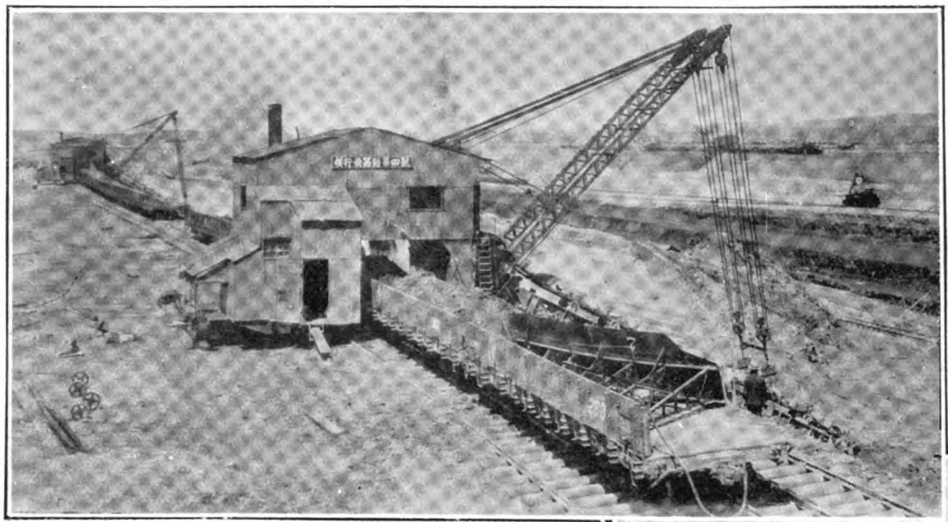
The engine room outfit includes independent condensing plant automatic feed pumps, bilge pumps, service pumps, filter and evaporator. An outfit of machine tools is provided, capable of dealing with minor repairs.

Huge Shale Oil Distillation Plant for Fushun

How Japan will Solve Her Fuel Oil Problem

Manchurian Shales can Supply 1,500,000 Tons of Crude Oil Annually for Two Centuries

WHAT promises to be one of the greatest industrial undertakings of its kind in the world is now on a fair way to be realized by the erection of the initial unit of a huge dry distillation oil shale plant at the Fushun collieries of the South Manchuria Railway Company. The entire coal deposits of Fushun are overlaid with an oil shale stratum that has to be stripped and carted away in order to work the coal seams, so the cost of extracting the shale, being chargeable to the cost of mining, more than offsets any possible disadvantages encountered in working similar deposits in other parts of the world. For the next half century at least,



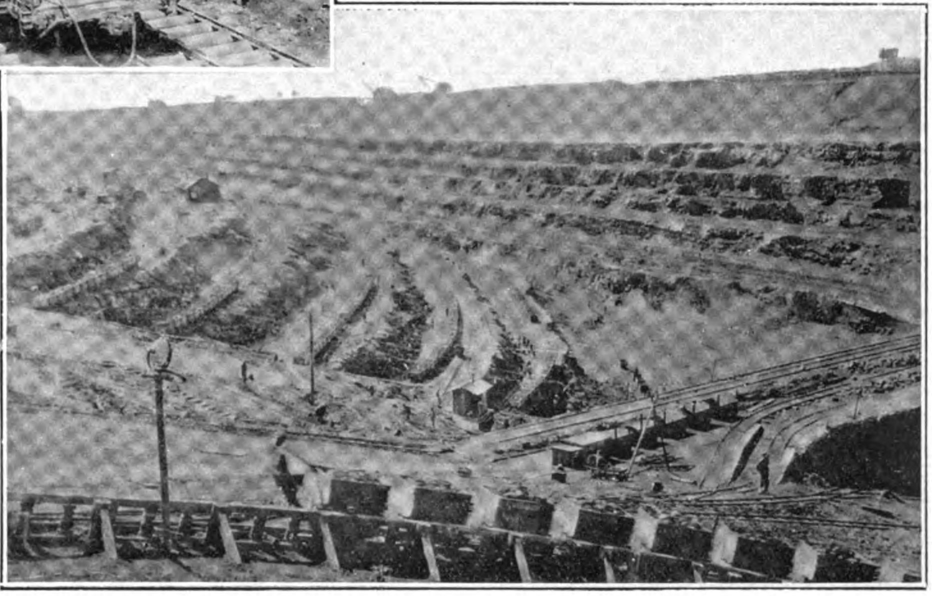
Fushun Coal Mines: This view shows two of the large steam excavators stripping the shale from the new open cast coal workings at Fushun, delivering the shale direct into railway dump cars.

coal mining at Fushun will be confined in the main to working the immense open cast pits where the stripping will be performed by modern excavating machines delivering the shale directly into railway cars to be hauled the short distance of about a mile to a site already marked off for the dry distillation plant next to the new power house on the banks of the river and alongside the railway tracks. There are now three of these excavating machines stripping the new open cast workings and several American steam shovels of the Bucyrus make. The excavators are of German design built in Japan. It is altogether probable that when the oil shale distillation plant is working successfully several more similar excavating machines will have to be employed to furnish the shale.

The situation at present is that an expert of the S.M.R. is visiting America and Europe inspecting the various oil shale distillation plants in operation in order that the company may decide upon the very best apparatus for erection at Fushun. In view of the fact that the Fushun shale closely resembles that found in Scotland and that the tests on the Fushun shale have been conducted by Scotch experts, in all probability the order for the new Fushun apparatus will be placed in that country. The initial plant, we understand, will handle 700,000 tons of shale per year and will cost about Y.7,000,000. The Fushun shale averages eight per cent. of oil, though some of the samples test out as high as ten per cent. The plant, however, is expected to extract at least seven per cent., thus giving a total annual output of 50,000 tons of crude oil.

If the results from this preliminary plant are satisfactory, it is the intention of the S.M.R. authorities, backed up by the Japanese government, to enlarge it to a point where it is confidently hoped that the Fushun shale deposits will completely free Japan from oil importations from America. The S.M.R. authorities have already drawn up the plans and estimates for an expansion program to extend over a period of five years at a cost of some Y.50,000,000. As there seems every reasonable prospect of this venture being a success from the start, the manufacturers whose apparatus is installed in the initial plant, will have paved the way for a very lucrative business.

For Japan, the success of this Manchurian oil shale distillation enterprise is of more than ordinary commercial interest. Her existing oil fields are nearing exhaustion and she must fall back on Fushun and what she can manage to save out of the wreck of her Siberian adventure through negotiations with the Soviet for the control over certain Saghalien fields. It is not so much a business enterprise of the S.M.R. carried on for their particular profit, as it is of national security and prestige. Like England, during the world war, when the latter country awoke to the fact that she was outdistanced by the United States in the matter of oil fuel supply for her navy, Japan now faces the same problem. The British wasted no time in academic discussion but went to work with a will to develop the shale oil deposits in their own territory and reached out for a larger share in the exploitation of oil deposits in foreign countries. To England alone is due the credit for developing the oil shale industry to a point where it is now commercially profitable and



This view gives a good general view of the shale deposits covering the coal seams in the Fushun open cast workings

(Continued on page 488).

Far Eastern Harbor and River Improvements

Call for Huge Expenditure

RAPID expansion of commerce with the Far East coupled with the ever increasing tonnage and draught of the steamers in trans-oceanic trade has brought about such an acute need for greater harbor facilities and docks that more than $100,000,000 is now earmarked for expenditure in the next few years for river and harbor improvements in China, Japan, French Indo-China, Macao, the Federated Malay States and Dutch East Indies. Most of these projects have passed the " paper " stage, some have been given governmental sanction, while several have been allotted the funds necessary for an immediate start of the work.

Any effective improvement of existing conditions must be preceded by adequate technical investigations into which two great factors enter. One is the feasibility from an engineering standpoint, and the other is whether the expenditure will be economically worthwhile. The second of these factors has led to an adverse report on the improvement of the Yangtze to enable ocean-going vessels to reach Hankow during the season of low water. According to Mr. F. Palmer, consulting engineer, the funds in sight not only are insufficient, but the improvement is not warranted by the advantages to be gained, he says in an exhaustive report on the subject.

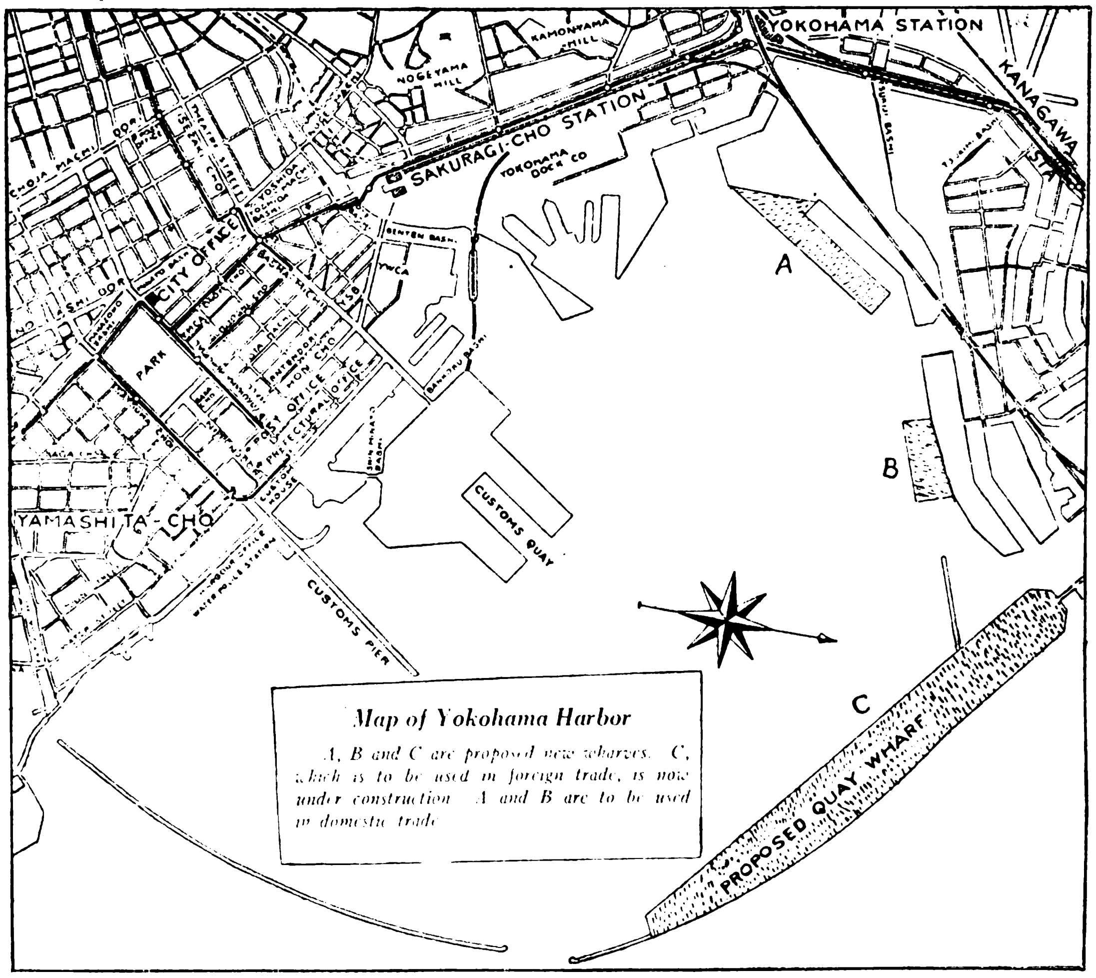
The question of funds also enters into the project to improve the river approaches to Canton, but in this case the sale of reclaimed areas would pay 75 per cent. of the cost even if the costly bridge to connect Canton with Honam is included. So far as the projected improvements at Hongkong are concerned, only two small appropriations have been made, principally to cover expenses of consulting engineers, so that these schemes which also include reclamation of large areas that would cut expenses in half must be considered as in abeyance for the present.

The most urgent of these harbor works, undoubtedly is that to make the harbor of Tokio available for steamers considerably larger than the 3,000-ton ships that formerly were the limit in the area of that port. The plans for this much needed improvement have been drawn up by successive municipal administrations in Tokyo but invariably the scheme has been postponed because of the huge financial outlay, far exceeding the ability of the municipality to meet. The scheme as outlined below was finally taken over by the imperial government but its financing is still a matter which occupies considerable attention on the part of the authorities.

The Port of Tokyo

The home department announced some time ago that the construction of the Tokyo harbor and a canal connecting it with Yokohama had been definitely decided upon, the work to be started this year at an estimated cost of Y.46,500,000 covering a period of six years. The report stated that the Yokohama canal would cost Y.25,000,000 alone. This project will cut the present 24 miles of open sea lighterage to 16 miles and avert the dangers incidental to barge traffic on the exposed bay route. This scheme has held the attention of the authorities for many years as the expenses attached to the transhipment of cargo at Yokohama to the railway and the railway transportation charges between Yokohama and the capital is a heavy toll on merchandise destined for Tokyo and points north. Out of an average yearly 7,500,000 tons of cargo handled at Yokohama, 3,700,000 tons are destined for or shipped from Tokyo. The importance of the lighter traffic between the two points is better understood when it is known that only about 200,000 tons of this cargo is handled by the railway, leaving some 3,500,000 tons to be transported by lighter.

When the earthquake and fire destroyed Yokohama's harbor facilities and threw an increased load on the lighterage business the charges on cargo for Tokyo jumped from Y.1.80 per ton to Y.6 to 7 and even higher, equivalent to the rate charged on cargo between Yokohama and Shanghai. Lumber which paid a trans-pacific freight rate of Y.12 a ton, was assessed an additional Y.7 for the 28-mile lighterage from Yokohama to Tokyo. This traffic gave employment to some 8,000 lighters of which 60 per cent. were destroyed during the fire, leaving 3,000 to cater to the abnormal traffic which ensued. The resultant exorbitant charges reaching as high as Y.15 per ton for cargo forwarded from Tokyo to Yokohama with additional loading charges of Y.4.20 in Yokohama harbor with a



Map of Yokohama Harbor

A, B and C are proposed new wharves. C, which is to be used in foreign trade, is now under construction A and B are to be used in domestic trade

demurrage charge of Y.4 a ton and other stevedoring and incidental charges was such a tax upon commerce that the authorities were compelled to give immediate attention to the proposed canal scheme in order to ameliorate what threatened to become a prohibitive tax on materials for the reconstruction of the capital, and the development of its industries.

As a complement to the canal scheme the Tokyo harbor project involves the construction of mooring berths having a depth of 7½ metres at low tide along the water front of Tsukijima and Shibaura, and the dredging of the bay area to the same depth off the old Shinagawa forts in order to provide a channel that will permit steamers larger than 3,000 tons to dock at the Tokyo wharves. The principal improvements at Tokyo will be concentrated along the foreshore at Shibaura. Here in 1922, the Tokyo municipality had started on an improvement program that was to cost Y.6,800,000. This work was, however, temporarily cut short by the earthquake, and since then the original plans have been somewhat modified. For the present, work is being carried on in erecting sea walls and bunding and in dredging the channel out into the bay. Here two municipal dredges are at work. The first object of the authorities is to make feasible the entrance of 3,000- to 4,000-ton coasting steamers relieving Yokohama of the strain of handling domestic cargoes consigned to the capital. Private concerns are busy erecting warehouses in this district with an eye to future enlargements.

According to the municipal plan, the Hinodecho shorefront will have a long jetty projecting to the length of 310 *ken*, or 1,860 feet, from the shore. The jetty will have a breadth of 42 feet.

On the completion of jetty, four steamers of 3,000 tons class can be accommodated at a time. Eight steel-trussed goods sheds having the total floor area of 5,124 *tsubo* are now under construction and will be completed by the end of October. Cargo discharged here will be kept in storage in these sheds to serve the shippers' convenience. At the same time, the water area at Shibaura will be dredged deeper than ever. The bunding work involves the construction of a 4,000-foot wall.

Yokohama's Rapid Recovery

Although the greater portion of Yokohama's wharves, quays, breakwater and other harbor facilities were destroyed and are not expected to be re-established very soon, the solid work for reconstruction and reparation of the port is progressing successfully and shows great promise for the near future.

Immediately after the disaster, the government commenced repairs to meet the temporary requirements, spending Y.2,800,000 as an emergency expense. During the season 1923-1924 it is going to spend Y.7,000,000, for the reconstruction of the harbor on a more ambitious scheme than before the earthquake. Although there is only one pier left, it can moor at the same time four large Trans-Pacific passenger boats, ranging in length from 550 to 660 feet. It is noteworthy that the depth of the harbor has not been affected by the earthquake.

Every facility is now restored and foreign traders are assured that export and import business can be carried on with the same freedom as before the earthquake.

Warehouses and Lighter Facilities

Since the earthquake, exporters and importers of Yokohama have suffered greatly from the scarcity of warehouses. Special efforts were made to have the damaged warehouses and sheds repaired and also to build new ones. According to the report of the Yokohama municipal authorities, the are a of warehouses and temporary depôts provided for export and import cargoes are as follows:

	Pre-earthquake. *tsubo**	April 1924. *tsubo*
Warehouses	59,991	46,184
Temporary depôts	28,507	16,002
Open depôts	34,774	117,915
	123,242	180,191

(*1 *tsubo* equals 6-ft. by 6-ft.)

From the above figures it is obvious that the restoration of warehousing facilities has made rapid progress, and at present there are few difficulties and inconveniences connected with the importing and exporting of cargoes.

The number and tonnage of lighters pre-earthquake and at present is as follows:

	Number	Tonnage.
Pre-earthquake	2,828	227,040
Burnt	902	72,160
Missing	211	16,880
At present	2,184	174,720

Determined to retain the maritime position of the port the Yokohama municipal authorities have perfected plans for further enlargements under a fourth period expansion scheme. The landing capacity of the harbor to-day, is 9,500,000 tons and upon the completion of the third period expansion scheme, now in progress, there will be an addition of 2,500,000 tons, making a total of 12,000,000 tons. Under the fourth period expansion scheme breakwaters will be constructed between Juniten, Hommoku, and the entrance to the Tsurumi river, Tsurumi. The new enterprise, it is estimated, will cost Y.65,000,000.

The Yokohama municipality has approached the central government with a request that it undertake the construction of a new breakwater between Juniten and the Tsurumi river, on condition that all other necessary arrangements inside the new breakwater should be carried out by the local municipality.

Further, the Yokohama authorities will undertake the reclamation of the sea-front near the entrance to the Tsurumi river to the extent of 650,000 *tsubo*, of which 200,000 *tsubo* will be utilized for the construction of roads, a canal, etc. The remaining 450,000 *tsubo* will be rented to individuals and companies for the construction of factories and workshops. From this particular source, the authorities hope to obtain receipt of Y.1,620,000 annually.

A municipal loan of Y.14,000,000 is to be floated, either at home or abroad, for starting the above enterprise.

In presenting the foregoing information the Yokohama chamber of commerce adds a few comments on the problems connected with the construction of Tokyo harbor.

The proposed construction of Tokyo harbor was planned by the municipal authorities of Tokyo, but finding it entirely beyond their ability to accomplish such a scheme, the government had to take up the matter and tried to complete it under its own management. However, up to the present, due to financial difficulties, it has not achieved any success. Although it is unknown at present when and by whom the scheme will be carried out, there is reason to believe that the plan for the construction of the port of Tokyo will materialize some day, for the necessity is fully realized by both the government and the citizens.

According to careful investigations made over the various plans hitherto published, the construction of Tokyo harbor will not bring forth any competitive factors against the port of Yokohama, as the plans do not propose to make it the calling station for ocean-going steamers, but for coastal vessels only of about 5,000 tons. This will be done by dredging the Tokyo side up to 25-ft. The consensus of public opinion is that the building up in Tokyo of a port as big as the present port of Yokohama is not only unnecessary, but an unbearable financial burden for the nation. From the foregoing, it is hardly necessary to add that Yokohama will certainly remain as one of the foremost ocean trade ports of Japan as well as a portal to Tokyo from abroad, even assuming that another port might appear in its vicinity in the future. The construction of the canal between Yokohama and Tokyo, the plan of which has been practically decided upon and will be accomplished sooner or later will also lead to the future prosperity of the port of Yokohama.

The latest announcement made by the government is to the effect that wharves at Yokohama, including the warehouses will be completely reconstructed by March, 1925.

Modern Harbor for Shimidzu

Situated in the heart of Japan's tea district, the port of Shimidzu is being improved by the harbor authorities of the home office to take care of the increasing trade for the Shidzuoka district. Many of the vessels which enter the port are great trans-Pacific liners loading tea cargoes. These anchor about 1½ miles from shore and receive their cargoes from lighters. The new improvements started in 1922 will consume about six years and cost about Y.5,500,000. In the main, the operations consist of dredging a deep-water

basin and using the dredged material to reclaim land to be used in connection with a railway terminal to permit the transfer of goods direct between the railway cars and ship's side.

In the accompanying map the area proposed to be dredged is shown by dots, the shaded area representing the land made or at least developed by reclamation. The parts of the deep-water basin adjoining the section of the reclaimed land where it is intended to accommodate ocean-going vessels will vary in depth, 600 feet of the frontage mentioned facing water 35 feet deep, another 600 feet facing 30-foot water and 780 feet facing 24-foot depth, while the remainder of the deep-water basin, extending almost due north from the sections mentioned, will be of 35 feet deep, all these figures having reference to depth at low water. The dotted section of the Tomoegawa River, which cuts in two the reclaimed area, will be dredged to a depth of six feet and will be used as a shelter for fishing craft. The entire dredged area will measure 117,000 *tsubo* (one *tsubo* equals 36 square feet). The reclaimed area will be divided into two sections by the Tomoegawa River, of which that facing deep water will consist of an area of 23,000 *tsubo*, while the reclaimed land south of the stream will measure 90,000 *tsubo*. The former section will be used for terminal facilities, sheds and the like. The latter will be employed partly for railway terminal, while the remainder thereof will be used for industrial purposes and will be given over to private persons or concerns, though whether it will be sold outright or only leased has not as yet been decided. A bridge will be built across the river in order to connect the two sections of reclaimed land, and the railroad which now goes only as far as the sampan basin will be extended to the reclaimed area.

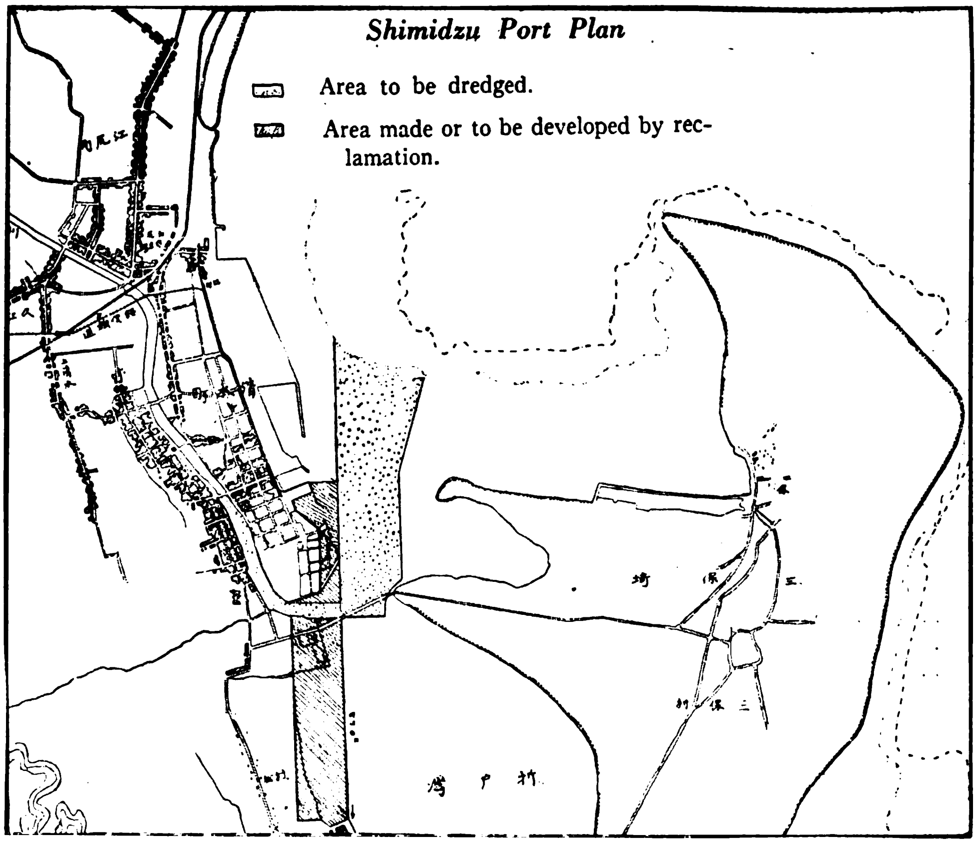
The dredging is being carried out by a bucket dredger and the material placed in scows which convey it to a suction pump by which it is distributed over the reclaimed area. The new improvements will be more than sufficient to handle a traffic of over 300,000 tons annually, or more than sufficient to meet the requirements of the port for some years to come.

Enlarging Kobe Harbor

In our September 1921 number appeared a full official report on the Kobe harbor improvements, since when, the Japanese government has adopted a nine years extension program that will call for an additional Y.62,500,000 expenditure, of which the government will pay Y.32,500,000 and the city of Kobe the balance.

The present extension was provided for in the original port improvement plans and calls for the enlargement of the harbor from 3,000,000 tsubo, its present area, to 5,000,000 *tsubo*. This scheme provides for the extension of the present breakwater, which when completed will consist of five sections aggregating 21,546 feet in length with two main entrances each 990 feet in width and two smaller entrances each 300 feet in width. At present only 7,812 feet of breakwater has been completed representing a cost of Y. 2.670,000. The entire breakwater is estimated to cost Y.15,000,000.

The present harbor extends from Wada point to Wakinihama but the new harbor area will be bounded by Wada point and Shinsaiki. The new extension will add four piers for berthing foreign trading steamers to the present three piers used exclusively for this service. Reclamation work and quays now under construction for the berthing of coastwise steamers will cost Y.9,300,000 of which one-third is being defrayed by the government and the balance by the city of Kobe. In addition, the Kobe authorities are compromised to spend Y.10,000,000 for the construction of railway facilities and the erection of new warehouses on the new quays.



The Hakata Harbor Project

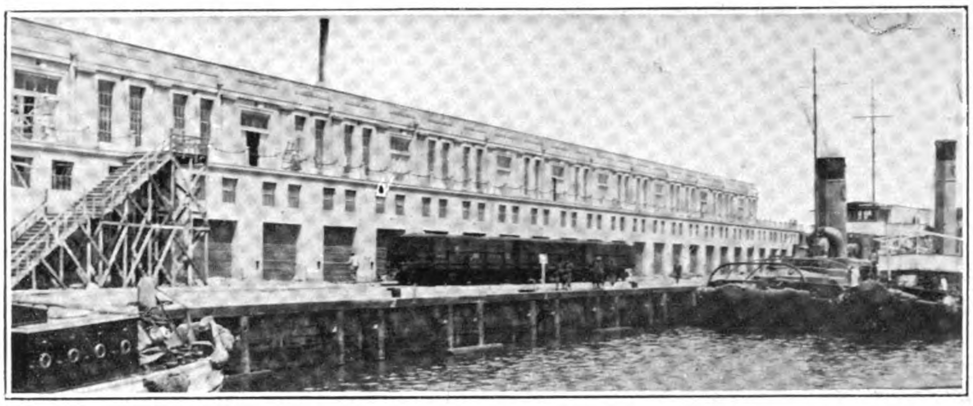
The contract for this work has been given to an American engineering firm of Shanghai, the Asia Development Company, headed by Mr. Paul Page Whitham and expert in river and harbor work. Mr. Whitham is now in the United States in an endeavor to raise the capital for carrying the scheme into execution. A full description of this work will appear in the next issue of The Far Eastern Review.

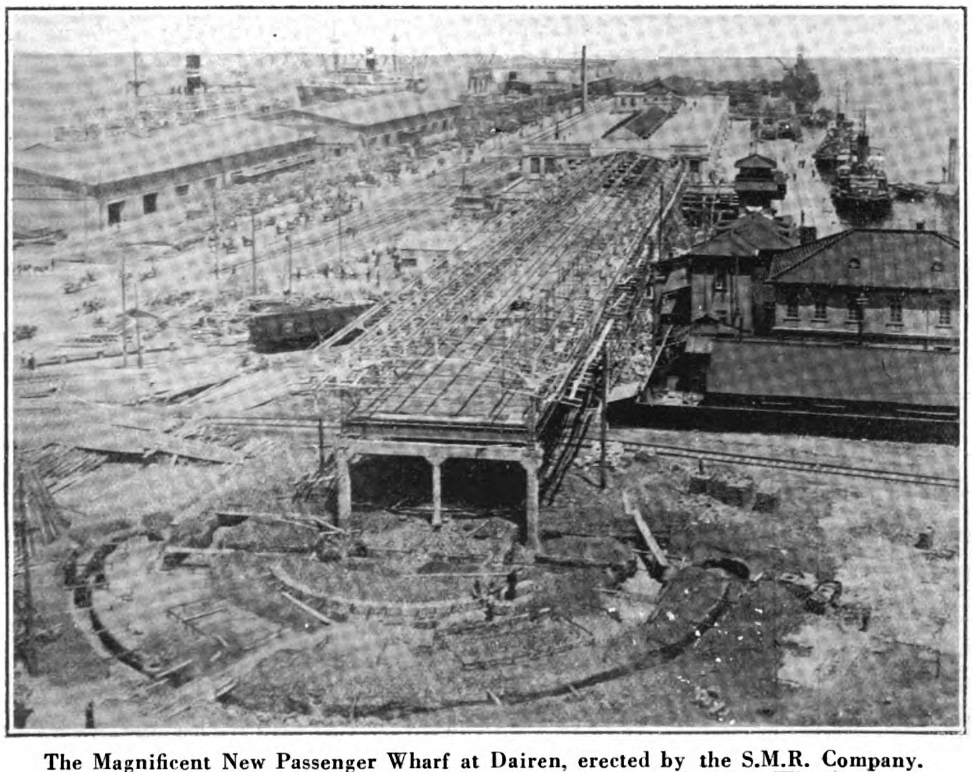
Harbor Improvements in China

In reviewing briefly the many schemes for improving the rivers and harbors of China we confine ourselves to such works as have not already been fully described and illustrated in previous numbers of this magazine. Amongst these are the Chefoo and Chinwangtao harbor works, the ports of Dairen, Tsingtau and Newchwang, the Fitzmaurice scheme for Hongkong and the project for a new harbor for Shanghai. Considerable space might be devoted in describing projects for the minor ports which have small of hope of being carried out under present conditions and considerably more space might be wasted in reviewing the many river and canal conservancy schemes covering nearly every district in China, but as these are all in the embryo stage and with little chance of ever being financed, they resolve themselves for the present into mere projects, many of which are designed and promoted by interested parties in the hope that they may serve as the basis for a foreign loan or be accorded consideration in the distribution of foreign flood and famine relief contributions.

Dairen, the Second Port of China

The splendid port works of Dairen, in many respects the best in the Far East, stand as a monument to Japanese enterprise. The work of construction and improvement has been vigorously pushed forward by the South Manchuria Railway Company until marvellous changes have been wrought on land and water. A full illustrated description of these port works appeared in the June 1922 number of The Far Eastern Review. It is difficult to keep pace with the constant improvements, additions and extensions planned and carried into execution by the S. M. R. authorities in order to cope with the increasing volume of trade. New concrete warehouses with special cargo working appliances have taken the place of the old open storage system, a beautiful modern fireproof office building houses all the different harbor offices and special equipment of all kinds has been installed and is being constantly extended to take care of the many





The Magnificent New Passenger Wharf at Dairen, erected by the S.M.R. Company. Unquestionably one of the finest of its kind in the world. This Wharf is still unfinished. It is to have a semi-circular entrance pavilion, built in ornamental concrete work which will add dignity to what is already a handsome structure

requirements of loading and unloading vessels. The handsome wharf office building referred to above is now having an addition built to it that will double its size, and a new up-to-date pier is nearing completion. This pier undoubtedly ranks as one of the finest in any port in the world, surpassing in its detail of construction and general appearance the pride of the Manila harbor board, Pier No. VII. A full and up-to-date description of the port of Dairen will appear shortly in a subsequent number of THE FAR EASTERN REVIEW and we content ourselves for the present with publishing three illustrations of the new passenger pier, whose entrance building is still under construction.

Tientsin's Fight to Maintain its Port

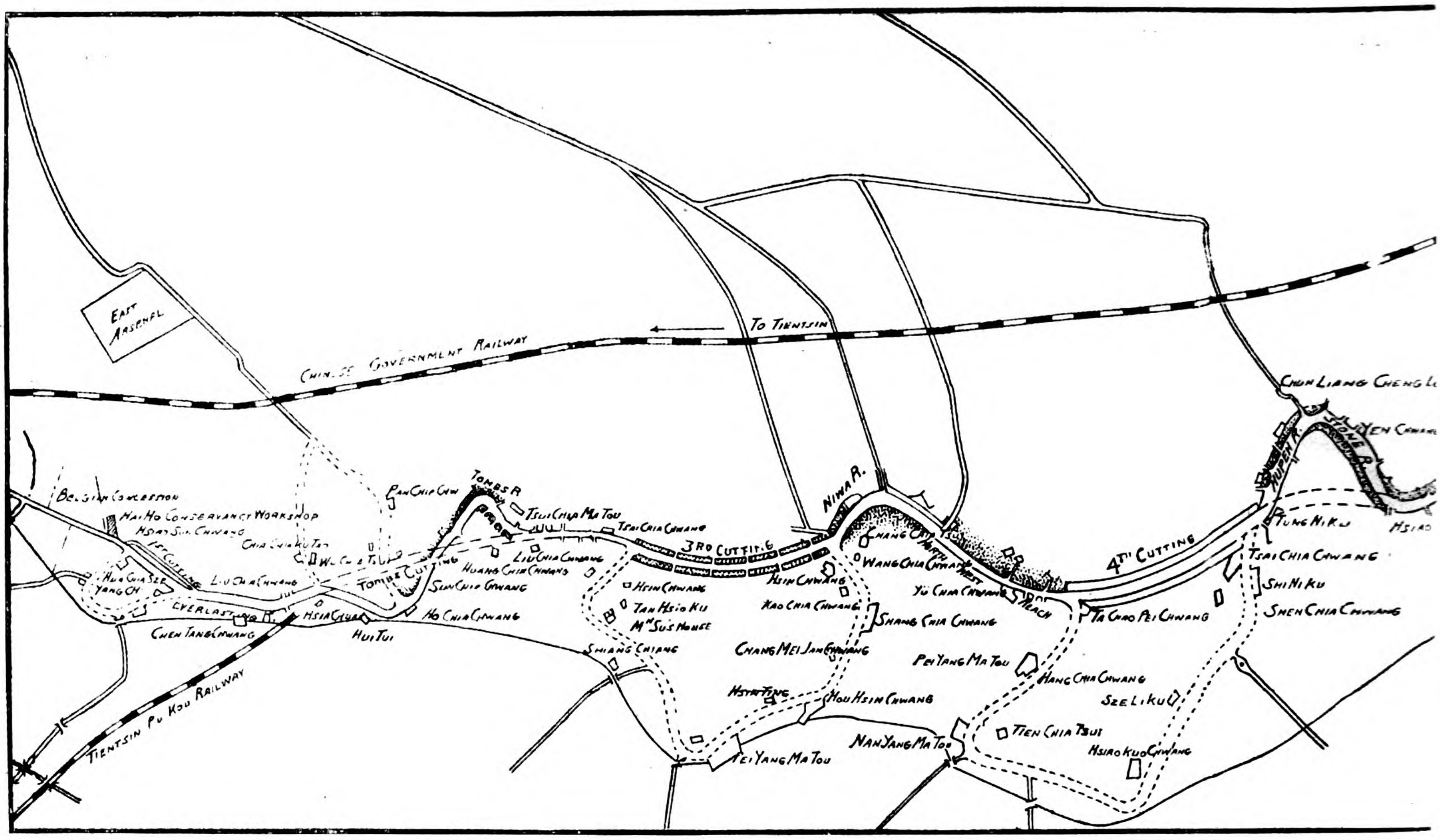
The problems confronting Tientsin's efforts to maintain its place as a coastwise port, in themselves quite formidable, are intensified many fold by the graver problems arising out of the inability of the Haiho to take care of the enormous flood waters that periodically devastate its hinterland. Two special commissions have been created to attend to these problems, one, the Haiho conservancy board, which maintains the river open to navigation from Tientsin to the sea, and the other the commission for the improvement of the river system of Chihli.

The work of the first body has progressed steadily and favorably since its creation, but each year seems to bring with it constant additions to the original project. Most of its work has consisted in making cuttings to straighten out the kinks in the Hai-ho's leisurely way to the sea, the work being performed by dredgers and excavators. A brief *resumé* of the Haiho conservancy work for the past ten years will give a general idea of the problems met with and solved in order that Tientsin may retain its position in the China coast trade.

What is known as the fourth cutting was opened to traffic on the 15th July, 1913. The total excavation was 865,000 *fang* and the cost was 27.3 candareens per *fang*. The third cutting, which was excavated by manual labor, cost 43 candareens per *fang*. The new cutting reduced the length of the river by 5.64 miles. The length of the river to-day is 36 nautical miles, whereas prior to the making of the cuttings the length was 48.8 miles. A new cutting—called Tombs Bend Cutting—was started in the spring of 1921, to be completed in the autumn of 1923. It will not shorten the river very much (about 1 mile), but eliminates four bad bends which hamper navigation and ice-breaking. The excavation is being done by dredger in a similar way as the fourth cutting.

Every technical authority who has examined the Haiho has urged the great improvement that would accrue in the propagation of the flood tide if the loop in the Peiho above the concessions could be removed, and in 1916 a company was formed at the instance of General Yang I-tê, and the expropriation of the site of the cutting carried out. The cutting was made in accordance with plans prepared by Mr. T. Pincione, engineer-in-chief to the Haiho conservancy board, under the ægis of the commission for the improvement of the river system of Chihli; but the cost was borne by the aforesaid company, which hopes to recoup itself by means of the land to be reclaimed in the old arm now cut off.

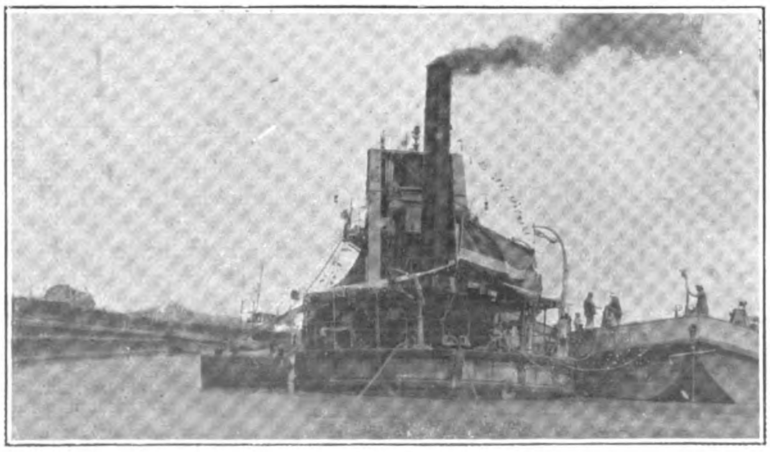
The beneficial effect of this work is evidenced in the improvement in the propagation of the flow tide whose rise and fall just above the cutting has increased by almost 3.5 feet. A subsidiary

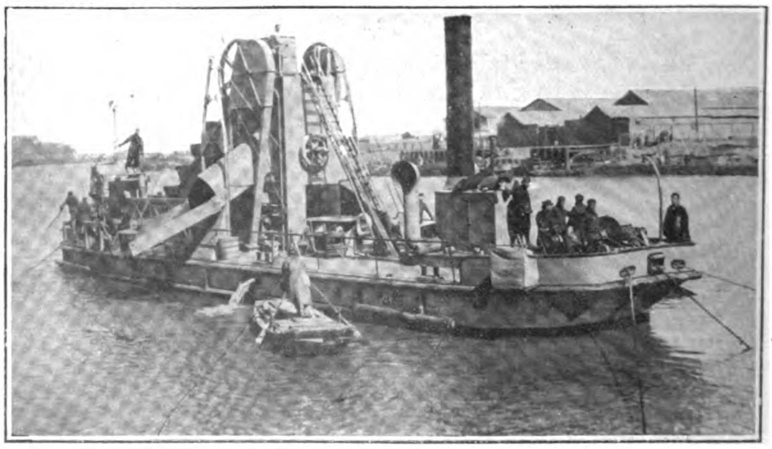


Plan of the Hai Ho Showing the Cuttings and Conservancy

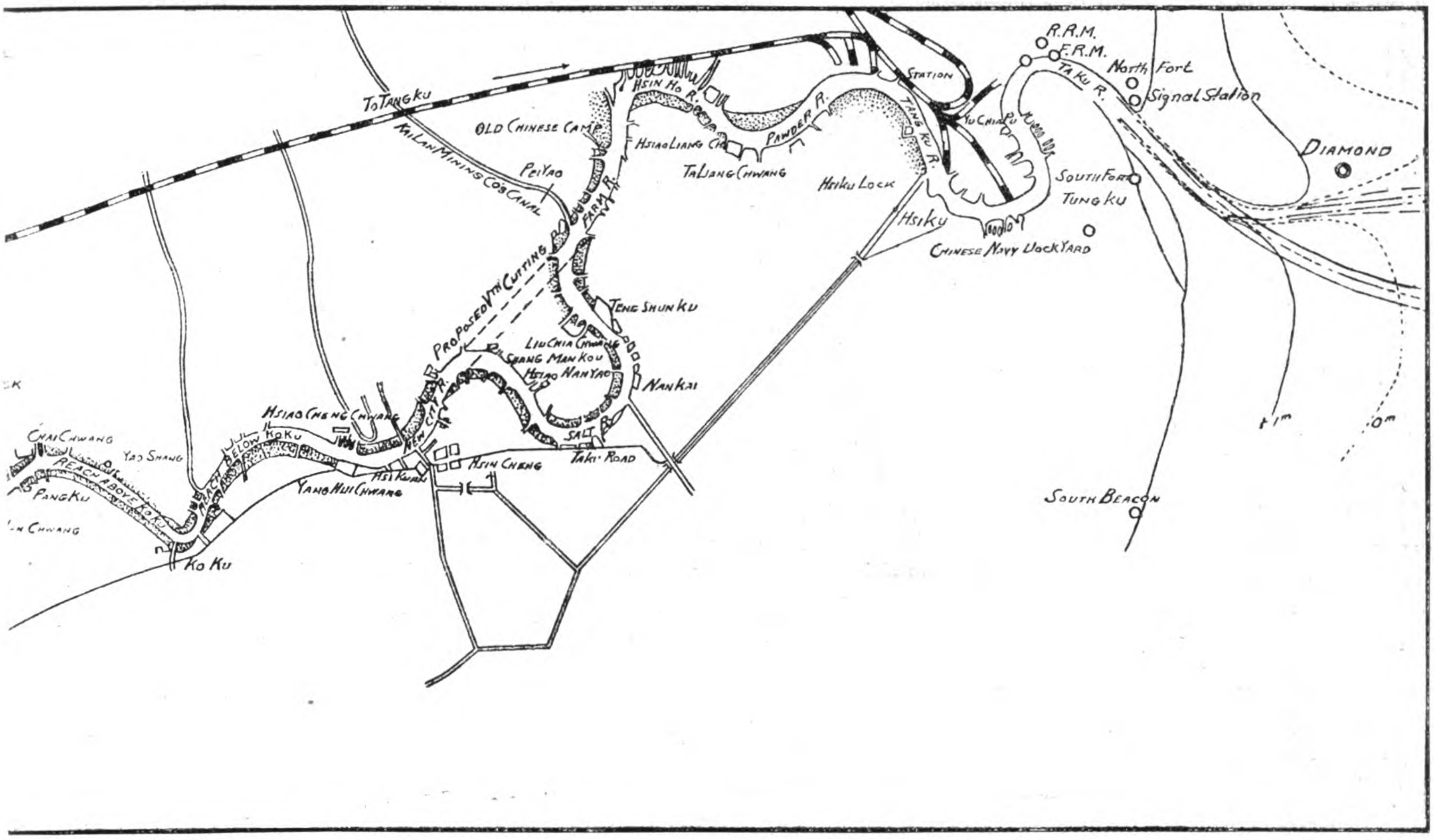
work was the making of a new outlet for the Grand Canal which now debouches just above the bridge opposite the governor's yamên. This has enabled the bridge at the former Hai-kuan-tao's yamên to be removed, a considerable benefit for street traffic. Arrangements are now being made for substituting the above-mentioned bridge opposite the governor's yamên with a mohern bascule bridge with a free opening of 100 feet.

As a further effort to improve the port, the Haiho conservancy commission recently approved and accepted the report of M. Perrier which provides amongst other things for improving the harbor facilities of Tientsin by dredging and building a new dyked-in channel 29,000 feet long across the outer Taku Bar, witd a low water depth of 20 feet, and involving a possible outlay of Tls. 2,200,000. The plan calls for the building, in a direction south by 56 degrees east, of two long dykes, providing a channel between them as wide as the present mouth of the Haiho, about 1,000 feet, and diverging slightly, as they extend out to the farthest end, to about 1,100 feet. This channel will be dredged by a special dredger to a depth of 20 feet at low water. Each dyke will consist of two lines of piles, for a short distance, ten, and the rest, five feet apart, filled in with rubble stone, which will also be placed outside at the base. The dykes will be elevated to 14 feet Taku datum at the top, and be of varying depths according to the set bottom over which they are built. For a distance of about 8,000 feet from the North Fort the dyke on the north side will be supported on either side by stone-faced low gradient earth banks, and will be 18 feet Taku datum at the top. By providing a low water depth of 20 feet on the bar, the new channel would enable deep draught vessels, now obliged to anchor eight to nine miles out beyond the bar, to cross the bar at high water, enter the river and even get up to Tangku, where they would find every facility for working their cargo under advantageous conditions. This would give inestimable benefits to shipping and commerce generally by reducing the heavy tran-shipment charges. In connection with this the Haiho river conservancy's plan of eliminating some of the remaining bends in the river, notably the Salt Reach bend, will be followed. Among the expenses that would be incurred is the purchase of a new hopper dredger at a cost of Tls. 450,000 and the adaptation of a present dredger at a cost of Tls. 50,000. The cost of constructing the dykes is estimated at Tls. 1,350,000. New workshops and installations at Tls. 341,000, making a total of Tls. 2,191,000.





Two of the Dredges Operated on the Hai-ho by the Conservancy Commission



Work from Tientsin to the Sea at Taku

Yangtze River Improvement not Worth While

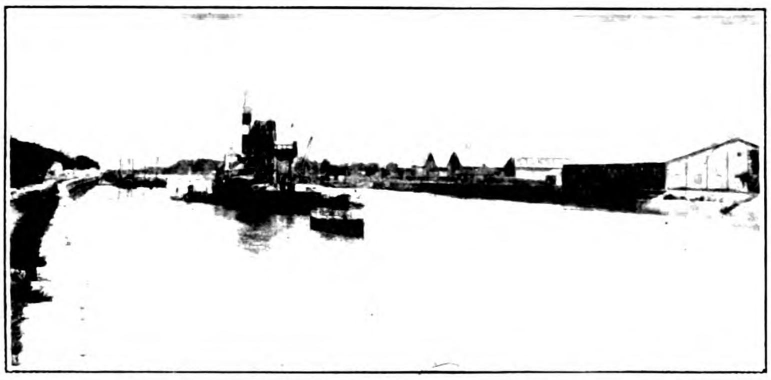
The most interesting and important navigation project in China which was hoped would bring Hankow into line as a permanent deep water port has been reported on unfavorably by Mr. F. Palmer, consulting engineer and British member of the Yangtze river commission. Intense disappointment has been manifested by every trading firm in China over his conclusion that the expense would not be justified nor the funds obtainable. In his report Mr. Palmer gives a description of the course of the Yangtze, taking it under three sections. Ichang to Chungking, Ichang to Hankow and Hankow to Woosung. As to the up-river stretch, he says that the value of the Hankow-Szechuan trade and the manner in which it is handled excludes the necessity of any extensive scheme of improvements.

Coming to the most important point of the problem, that of the Hankow-Woosung section, Mr. Palmer discusses the possibilities under three heads: (1) What improvement is possible? (2) What would it cost? (3) Would it pay? His conclusion is that to make Hankow accessible all the year round to ocean-going steamers drawing from 20 to 25 feet is out of the question.

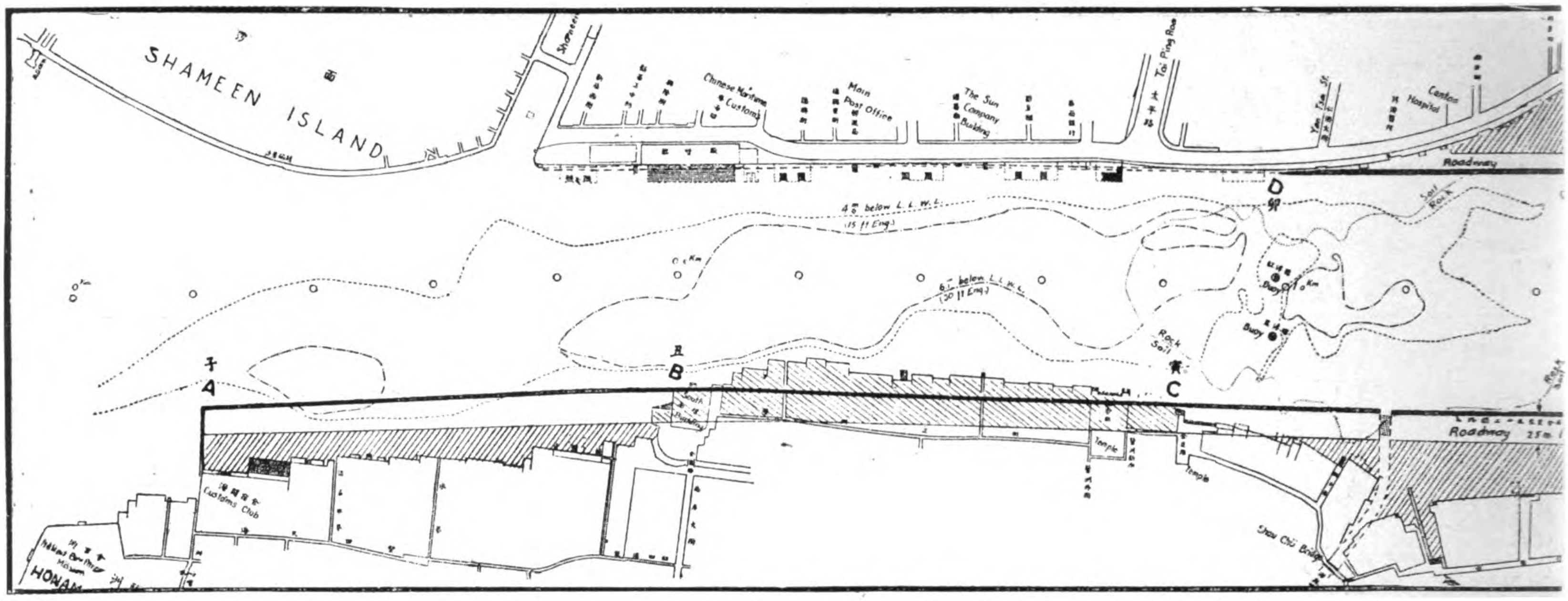
He points out that in 1922 the total trade of all Yangtze ports above Shanghai was Hk. Tls. 482,402,000, while the revenue collected by the customs at Shanghai for up-river goods was about Hk. Tls. 10,900,000. Assuming a surtax of five per cent. on this the Yangtze river traffic would have produced a revenue of Tls. 545,000 which would allow a capital expenditure of Tls. 5,450,000.

In the short time that the commission had existed it was obviously impossible to gather any exact idea of costs, but Mr. Palmer estimated roughly that to remove only one of the obstructions to 15 feet draft navigation would call for Tls. 3,500,000 and there are eight such obstructions between Wuhu and Hankow. This would call for an approximate Tls. 25,000,000 alone. Mr. Palmer then considered the possibility of dredging and concluded that the capital cost might amount to Tls. 2,500,000 and the operating costs about Tls. 350,000 per annum. Fixed charges and interest at 6 per cent., and amortization at 4 per cent. would amount to ten per cent. so the total annual charge would be about Tls. 600,000, a year, sum exceeding the five per cent. surtax already referred to. To cover this cost it would be necessary to increase the surtax to 7 per cent. on the trade of all Yangtze ports above Shanghai.

In investigating the value of the trade benefits to be obtained by removing the obstructions to 15 feet draft vessels, Mr. Palmer found that it would approximate Tls. 168,000 per annum and it



The Hai Ho at Tientsin.



Section of the Proposed Canton Harbor Improvements from Shameen to the Chu Kong Motor Boat Works.

followed that if the cost of dredging works reached Tls. 600,000 per annum, there would be no commercial justification in carrying them out. The finding of the commission is a severe blow to the commercial aspirations of several up-river ports, notably that of Chinkiang. Here a sitting up process has been going on for years and in time will close the port altogether to steamers. To improve the condition of the river at this port will call for training the Yangtze within normal lines for several miles at a cost of several million dollars, an expenditure altogether out of proportion to the trade benefits that might accrue to the port. This report practically sounds the death knell to Chinkiang's hopes which is told in so many words that it must adjust its future to the whim of the river. A persual of the decennial reports of the maritime customs discloses that aside from a few futile attempts to improve certain dangerous spots in the up-river rapids, no serious improvement or port works have been carried out in the Yangtze.

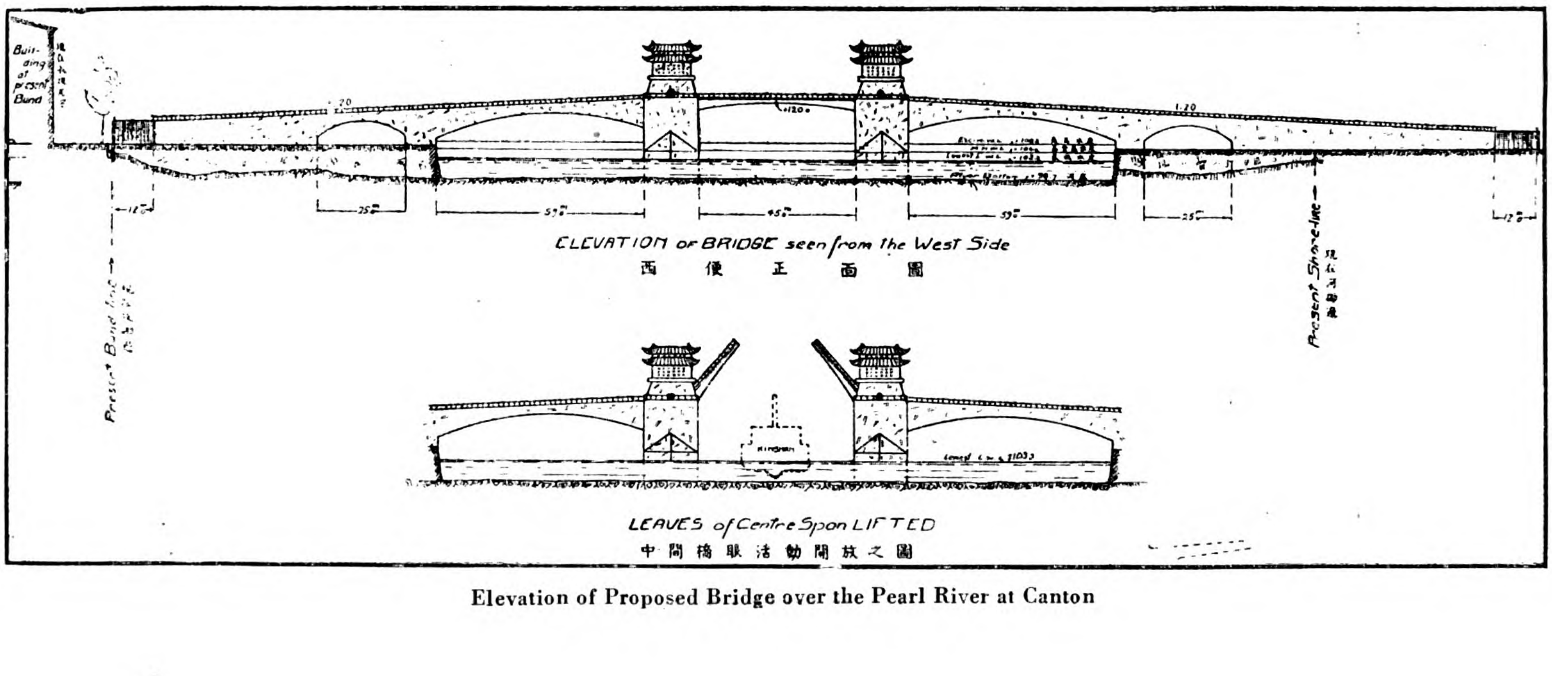
The Port of Foochow

After many years of decline the port of Foochow bids fair to regain some of its lost maritime importance by the execution of a scheme now well under way for the improvement of the Min River which connects this city with the ocean.

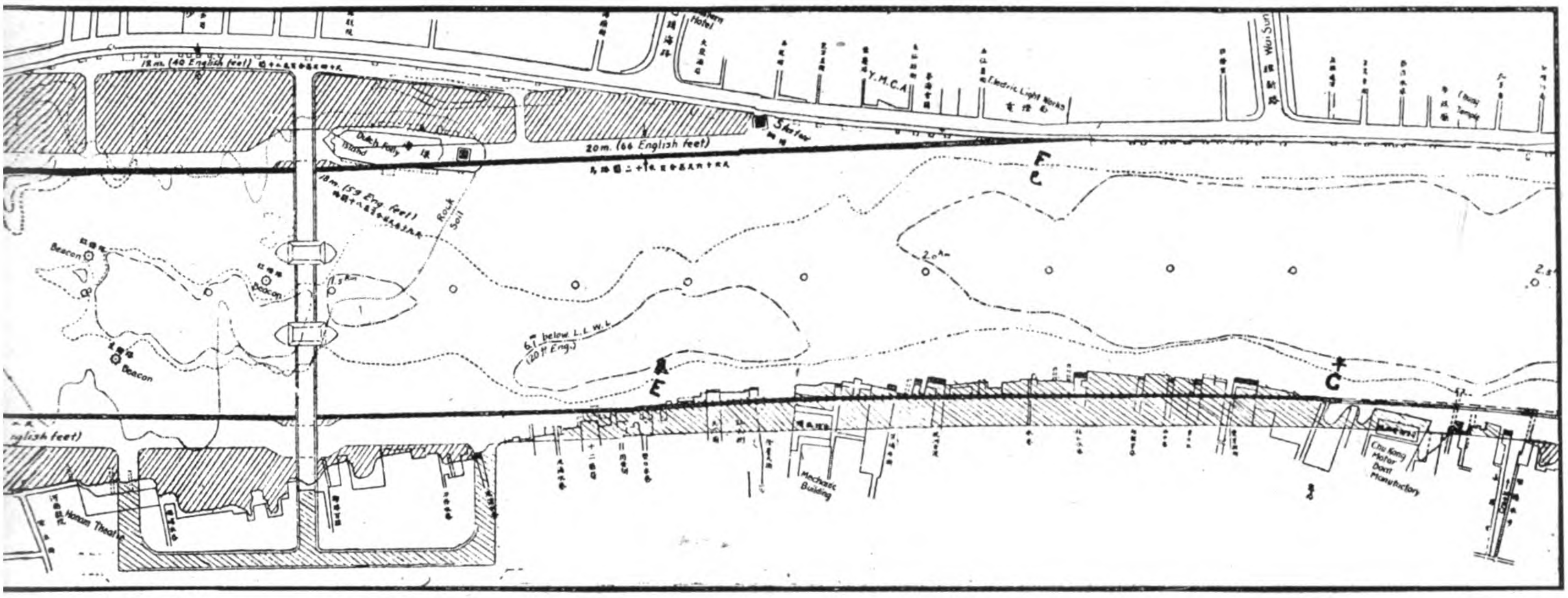
For a number of years prior to 1919 mercantile and other interests of Foochow had under consideration projects for deepening the channel of the river to at least 10 feet, which would allow navigation of the channel at high water by steamers drawing 17 feet. With this improvement ships could then go to Nantai harbor, opposite Foochow, thus eliminating lighterage to and from Pagoda Anchorage.

The project, which owes its inception to Mr. T. T. H. Ferguson, commissioner of customs, received the official sanction of the Chinese government in 1919 and the Min River conservancy board was created, represented by both Chinese and foreign interests, which functions through an executive committee composed of two Chinese officials and one representative of consular officials.

The object of the Min River conservancy is to effect an improvement of the navigable channel from pagoda anchorage to Nantai harbor from a low-water depth of 2 or 3 feet to 10 feet, which would allow of high-water navigation of steamers up to 17 feet draft. The preliminary scheme was prepared by Mr. H. von Heidenstam, engineer-in-chief to the Whangpoo conservancy, Shanghai, and is being carried out by Mr. J. R. West, as engineer-in-chief. The constitution of the conservancy, drawn up in January 1919 and sanctioned by the Chinese central government and the diplomatic corps, provides for the necessary control by a general board and daily management by an executive committee; it defines the powers of the board or committee in collecting a special conservancy tax on the trade of the port, controlling the funds thus obtained, planning and executing works, engaging the necessary staff, etc. In December 1919 a loan of $630,000 was negotiated with the inspector-general of customs, Sir Francis Aglen, who interested himself in the scheme and nursed it through a very critical stage. This money is secured on the conservancy surtax



Elevation of Proposed Bridge over the Pearl River at Canton



Showing Principal Areas to be Reclaimed in the Centre of Canton, the Proposed Roadways and Bridge Site

and has to be redeemed in a period not exceeding 20 years commencing from 1st April, 1922. So far the surtax collection has sufficed to cover expenditure, but the work is now approaching a stage of development which necessitates a greater outlay. For improvement purposes, the river divides itself into three sections: from Nantai to Lienpo, Lienpo to Pektao, and Pektao to the government dockyard at pagoda anchorage. The construction in the first section has been completed and that in the third section started. The second section has a good channel for nearly its entire length, and since there are two schemes for alignment in this section, there is every reason for leaving it to the last. It was hoped that the whole of the training works would have been completed in three years from the start, but certain factors were not taken into consideration at the commencement. It is estimated that a third of the time is wasted (that is, the work held up) by freshets, heavy rains, and typhoons. In the question of material the conservancy has experienced considerable difficulty in obtaining stone and bamboo in proportion to its requirements, making impossible to complete the work in the estimated time. However, the river already shows considerable improvement, and, although the shifting of the channel, due to the training works, still causes some inconvenience, there is no doubt that, on the whole, navigation is becoming easier.

The plan of work adopted and put into operation consists in protecting the banks and building training dykes on the concave side of the curves in the river, spur dykes on the convex side to cause contraction of the channel, and closing dykes across all secondary channels. By this method it is expected that the narrowing, straightening, and deepening of the channel will be largely done by the river itself. As the existing banks are scoured back to the desired line or when the new banks are built out to the desired line, they are protected by broken stone. The silting up of desired areas is effected by the construction of training dykes of stone or permeable dykes of planted bamboo or poles and brush; these cause, in addition to the slowing of the current and silting, the gradual diversion of an increasing amount of water into the main channel.

In the early part of this year the Min River conservancy board purchased through Duncan & Company of Shanghai for delivery this autumn, a suction dredger with an excavating capacity of 200 cubic yards per hour and 2,000 feet of pipe line. The dredger is made by Lobnitz & Co., Ltd., of Renfrew, Scotland, and cost £27,395. The employment of this dredger is expected to go far towards solving the difficult problem of controlling the heavy silting action of the Min River in the fairway below Foochow.

Hongkong Port Development

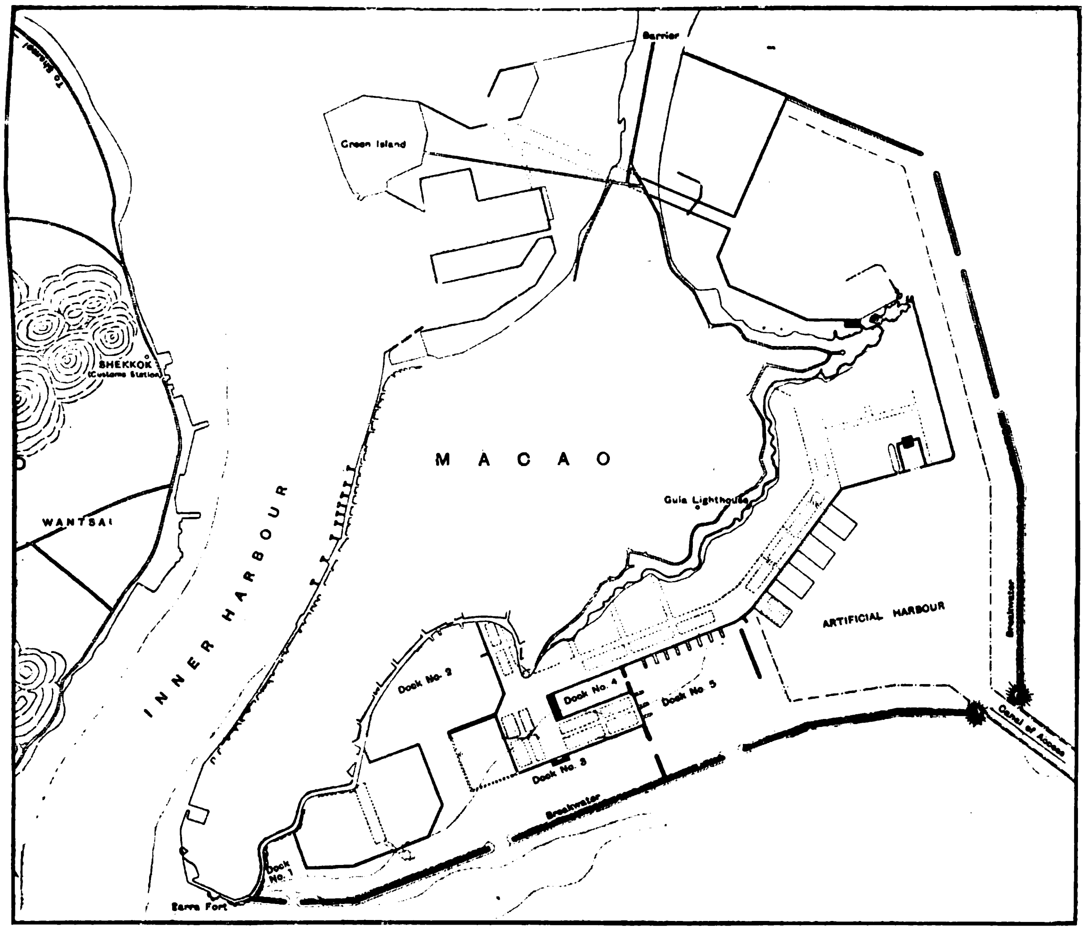
About a year ago we published the report and plans of Sir Maurice Fitzmaurice for the development of Hongkong's port facilities. This is generally known as the Hunghom Bay scheme, designed to meet every possible demand of the port for the next few decades. Altogether there are four schemes in existence for the improvement of the harbor:

(1) The reclamation of about 48 acres in Hunghom Bay, from which a series of six jetties would project in a southerly direction. As a first instalment about 7 acres of reclamation with two jetties is proposed, at an estimated cost of £1,200,000, which does not include the cost of warehouses, railways, crane equipment, etc. (2) The West Point scheme. This is a scheme that was drawn up three years ago for Sir Paul Chater, and involves the reclamation of 800,000 square feet of land, giving an approximate area in marine lots of 363,000 square feet, and having a fairly deep water frontage. (3) The North Point scheme, which includes the reclamation of a certain area, the erection of quay walls, and jetties, very much on the lines of the Hunghom Bay scheme. (4) Captain Davison, the marine superintendent of the Canadian Pacific S. S. Company, and Captain Robinson, the commander of the R. M. S. *Empress of Australia*, put forward a scheme shortly after the typhoon of August 18, 1923, whereby a large wet dock should be constructed on the northern side of the harbor, from Kowloon point westward, enclosing the naval camber, and the wharves of the Hongkong and Kowloon Wharf and Godown Company. The chief object of this scheme was to provide an efficient typhoon shelter for deep-water ships where they could lie at wharves, and continue the loading and unloading of cargo.

The main object to be kept in view in the consideration of all these schemes was the provision of a close connection with the railway in order to reduce the handling of cargo to a minimum, with the provision of berthage for large vessels and junks at an early date. The principal advantage sought from the West Point scheme was the better control over the Chinese passenger traffic. Though it was realized that junks could land passengers anywhere, still the arrangements rendered possible by the proposed scheme would enable the police to carry out their search and inspection duties on the river steamers more thoroughly, and in this way an effective check would be placed on the arms traffic and piracy.

If the basic consideration of close railway connection with the proposed improvements was to be the deciding factor, the West Point and North Point schemes, being on the island of Hongkong itself, must give way to the Hunghom Bay scheme, close to which is the existing terminus of the Canton-Kowloon Railway. Putting the control of the Chinese passenger traffic aside, which only bears indirectly on the trade of the colony, the North Point scheme would appear to be next in value. It lies opposite Hunghom Bay, and, as the ground that would have to be acquired is undeveloped land, it could be obtained at a small cost.

Early this year all these schemes were considered by a committee of the Hongkong general chamber of commerce which gave as its opinion that the West Point scheme should take precedence over the others and when work was started on the Canton-Hankow railway it would be time enough to start the Hunghom scheme. The West Point scheme is estimated to cost $2,000,000, exclusive



Plan of New Harbor Works for Macao

of wharfage, but nothing has been done by the colonial government to carry it out. The only progress made during the year was with the North Point scheme. A group of Chinese interested in the Java sugar trade, known as the Cheong Siong Land Investment Company, entered into a contract in July last with the Netherlands harbor works company for the construction of a quay at North Point to cost £400,000 which will provide 30 feet of water at low tide alongside the quay wall. Although the enterprise is entirely a private one the plans are approved by the government as part of the general harbor scheme and the work is being carried out under the direct control of the government's port engineer.

The much criticised procrastination on the part of the colonial government in definitely embarking on any expensive harbor development program would seemed to be explained by the continued turmoil in China which makes impossible that trade expansion which alone would justify such a heavy expenditure. The Canton harbor improvement scheme proposed by Major Olivecrona and sponsored by Dr. Sun Yat-sen and the Portuguese activities at Macao, while in no way endangering the supremacy of Hongkong as a deep-water port, must of a necessity have an important bearing on its general prosperity, and until economic conditions are once more stabilized in South China, and railway construction is resumed, it would seem that the colonial government's present policy is the wisest one.

A Deep Water Port for Canton

One of the most promising harbor improvement schemes in the Far East is embraced in the plans drawn up by Major G. W. Olivecrona (engineer-in-chief of the board of conservancy works of Kwangtung.) His proposed improvement of the front reach of the Pearl River between Shameen and the Whampoa barrier is the first comprehensive and practical scheme devised to carry out the cherished ideas of Dr. Sun Yat-sen to restore Canton's maritime prestige. Major Olivecrona brings this dream within the realm of practical finance by a careful estimate of costs amounting to Tls. 10,000,000, of which 75 per cent. will be covered by the proceeds from the sale of reclaimed land. The project calls for extensive dredging and rock cutting in the channel to a depth of 15 feet, reclamation, bunding and the construction of a bridge over the river to Honam.

The deepening and widening of the channel calls for the removal of some 171,500 cubic yards of rock and 504,000 cubic yards of sand, this material to be used in the reclamation work. The salient features of the scheme include the building of quays on the Canton side, 1.6 miles in extent and 1.38 miles on the Honam side having 15 feet depth alongside with space for a 65 feet wide roadway on the Canton side and 82 feet on the Honam side. All reclaimed land is to become public property. Several acres are provided for on the Canton side in which Dutch folly island will disappear as such and form part of the new reclamation. The next reclamation on the Canton side would take place on the stretch between the admiralty wharf and the Taishatau channel. A large piece of land would be gained on the outer edge of Kuper Island. On the Honam side, land would be reclaimed in front of the present customs club building, opposite to Dutch folly island, and to the harbor limits. In all 439,000 sq. metres (31,360 *chings*) of reclaimed land would be available. Only as much as will be needed for roadways and approaches to the bridge with their footpaths are reserved of the available land, the remaining areas to be sold in order to cover the costs for the improvements. The erection of warehouses along the roadway is to be left to private enterprise. The site for the proposed bridge is immediately above the up-stream end of Dutch folly island. This bridge would have three spans; the centre one movable with a free opening of 147.6 feet and two stationary ones with an opening of 193.5 feet each. The movable would consist of two leaves or bascules, hinged near the faces of the central supporting piers and opening upward. When raised, a space of 147.5-ft. between the piers would be left unobstructed to a height of 51-ft. above high-water. On top of the piers a superstructure in the shape of a gate tower would be built, which would add to stability of the piers, and at the same time, add greatly to the appearance of the bridge. The stationary spans to be constructed of reinforced concrete, but the piers and abutments of concrete only, the latter faced with granite up to high water level. The movable span would be constructed of iron girders, and the machinery for its operation placed in chambers made for that purpose in the piers. When closed, the height of the centre span above high water would be 46 feet and that of the shore spans 35.1 feet. This space would permit craft of the same size as the present steamers running on the Macao route, to pass, and also medium sized junks, without opening the bascules. As heavy traffic is to be expected, the total width of the bridge between the railings would require to be 59 feet. Of this, 9.8 feet would be reserved on each side for footpaths, leaving a roadway 39.4 feet in width. The report suggests that the superstructure on the piers could be used as restaurants, the rental from which would help to defray the cost of operation and maintenance of the bridge. The sloping approaches on both sides of the bridge would each have a length of 763 feet. The under portion of the approach following immediately after the stationary span would have an arch 82 feet wide, allowing a passage for traffic along the waterfront and under the approach. The harbor construction is estimated to cost H. K. $7,310,000 and the bridge H. K. $2,360,000, a total of H.K. $9,670,000. The sale of reclaimed land is estimated to bring in about H. K. $7,164,000. This will cover 75 per cent. of the total cost. The report suggests that the remaining 25 per cent. should be borne by the public of Canton. Thus they would have to subscribe a sum of H. K. $2,536,000. Of this amount $2,360,000 would have to be spent on the Honam bridge. By carrying the work on by successive sections, and selling off the reclaimed land, sufficient working capital would always be at hand, assuming the public subscription of $2,536,000 to have been paid up at the commencement of the work. The time that would

be taken to complete the whole scheme is estimated at five years. There seems to be no good reason why under normal conditions, the financing of this scheme should present any serious difficulties. Given an assurance of political stability in Canton, the funds to carry out this improvement might be readily raised in Hongkong. It is a safe proposition, brought within possible realization by the carefully worked out plans and estimates of Major Olivecrona.

Macao's Plans for Harbor Improvement

The Portuguese authorities are not standing by in idleness while Hongkong and Canton are perfecting plans for newer and better harbor facilities and have designed a $12,000,000 scheme for Macao which is intended to restore to that port some measure of its former importance before the silt brought down by the Pearl River closed the roadstead to all but lighter draft vessels.

The works already undertaken are chiefly to assist the present traffic of the port which amounts to some $27,000,000 yearly. These began three years ago with the yards and anchorages for native craft, a beach being prepared to serve as a cleaning place for junks, large efficient shelters for their use being established in a good position on the north of the peninsula. This enabled reclamation works to be undertaken with the material dredged from the harbor. Other improvements of a like nature are now being carried out at Taipa, where anchorages are being provided with a view to their use by the fishing junks. Altogether these minor improvements will cost $1,500,000. In the inner harbor, some progress has been made in dredging operations, making possible the enlargement of the quays, but the main features of the scheme have yet to be realized.

During the last three years an exhaustive review of old plans initiated as far back as 1887 has been made, and the outcome of the comparison of these with modern conditions is a radical decision to construct an entirely new harbor at Macao. This plan, which it is proposed to carry out at once, is very comprehensive, but the potentialities of the port, regarded from the point of view of its possible conversion into a railway terminus for the rich and densely populated district of Heungshan, has now relegated it to the position of being only the central feature of a larger scheme which takes into account the possibilities of the port as a commercial outlet. The whole scheme for the construction of the new improvements and extensions has been placed with the Netherlands harbor works company, the firm which constructed the fine harbor of Chefoo. The estimated cost is placed at $6,500,000 and the probable period of construction is three years.

The new harbor will be formed by two long moles enclosing the anchorage on the south and east, the area of dredging involved being 5,000,000 square metres, and the anchorage affording sufficient space for six steamers. The deep water channel leading into the entrance between the moles will have a length of 5,000 metres and a width of 100 metres. A sufficient depth in this channel will be maintained to allow steamers of a draft of 25 feet to enter the new harbor. The preliminary works in connection with the outer harbor have been commenced, with like improvements to those already in existence at Macao Siac, where are to be seen a shelter for small craft, completed reclamation works, and a large retaining wall in front of the area Preta. These works, however, are only a part of the vast scheme that is being considered for the port.

Unique Use for Culverts

ONE is constantly running across some striking example of the important part played by the manufactured product in the advance of civilization.

In the wilds of Nairobi a hunter, a short time ago, found himself in a perilous condition. Missing his shots at an enraged lion, he found nothing left to do but to run for his life with, apparently, no hope of escaping. What was his surprise, when despair had practically seized him, to stumble against a corrugated culvert lying in a gully awaiting placement. He did not stop to wonder how this highly specialized product found its way to those inaccessible wilds, so far removed from the white man's domain, but with the last expiring vestige of strength, wriggled his way inside. The enraged lion, prevented from forcing his way within, endeavored, in his rage, to tear the culvert apart. But the culvert, manufactured to withstand far greater and more incessant forces than those of lions, remained immune to his fury and the savage beast was, at last, compelled to retreat without his victim.

This incident illustrates the great advance that has been made by the American manufacturer in so fabricating his goods as to provide for their transportation under the most unfavorable conditions. Undoubtedly this corrugated culvert was of the nestable type, fabricated in sections, in such a manner, that these sections could be nested together so as to occupy very small space and allowing of transportation in almost any manner and by almost any means.

There is a firm in Canton, Ohio, U. S. A., The Berger Manufacturing Co., that manufactures these nestable culverts in such a way that very frequently they are carried as ballast on ships and are accepted by steamship companies, for export, on a weight basis as against cubic measurement basis. This allows these culverts to be shipped and transported practically everywhere,—on backs of camels, packed on mules and lamas and, in numerous countries, upon the backs of native carriers, thus permitting them to be installed in places where no other type of culvert could even be delivered. Below is shown a picture of such transportation.

There is told an interesting example of this in the building of the Madeira and Marmore railroad in Brazil. This road, at the time the tale was told, was the only way in which crude rubber could be carried to the coast. Every year thousands of dollars worth of this rubber was lost in the rapids of the Madeira River. After many experiments sixteen carloads of the nestable culverts, spoken of above, were transported through almost trackless jungles on the backs of natives to take the place of bridges on this railroad, it being found impossible to deliver structural iron there. In this way, it is claimed, millions of dollars worth of crude rubber was saved.

Another thing which has made these nestable culverts practicable in almost inaccessible places is their long life. The American manufacturer in his development of corrugated culverts now employs a rust and corrosion-resisting metal. This is accomplished by so adding copper to pure iron that it thoroughly mixes with it, very much as blueing mixes with soft water. In this way, the copper actually becomes a part of the iron, producing a pure copper alloy. This method of manufacture results in the formation of metal culverts so thoroughly rust-resisting that they enjoy an exceedingly long life even under the most unfavorable conditions.

The third advantage regarding these types of culverts is that they are not affected by freezing or thawing. This means that in whatever climate they are used, if properly installed, they will not break or crush. In addition to this, rough handling does not, in reality, affect them since, being elastic and flexible, they are able to withstand shocks and vibrations which would prove disastrous to more rigid types and, in this way, are sure to arrive at their destination without being cracked, chipped or broken.

Huge Shale Oil Distillation Plant for Fushun

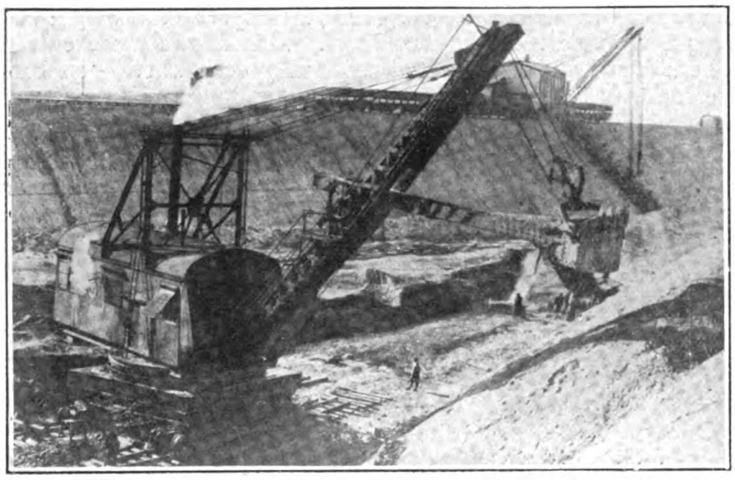
(Continued from page 477)

while she has been extending her control over new foreign deposits, the entire nation has stood solidly behind its government. There is little doubt that when the Japanese people understand the vital necessity of controlling similar oil supplies in territories which they hold in lease, they also will come together in support of an undertaking which promises them relief from foreign importations.

Although the Scotch report places the oil percentage 10 per cent. lower than originally expected by the Railway Company and the returns of sulphate of ammonia, a by-product, are quite discouraging, these somewhat unsatisfactory returns are discounted by Rear-Admiral T. Makino, now in the service of the S.M.R. Co., in charge of the new oil shale industry. He commented on the report from Scotland in substance as follows:

" In the first place the transportation of shale over so great distances has reduced it in size far below 2 inches in diameter which is accepted as the right size for distillation purposes. Moisture was absorbed and it was subjected to great heat in the ship's hold while under transit through the tropics. Owing to the reduction in size, the pieces of shale have become more susceptible to weathering action.

"The report admitted that better returns may be obtained, if experimented upon at the place where the shale has been mined.



Bucyrus steam shovel and excavator in open cut work at Fushun

The effect of weathering action had been expected by the railway officials and while the above returns cannot be taken for granted as applicable to all cases, if the interest on the fixed capital, and depreciation for buildings, machinery, etc., not to mention a suitable margin of profit, as in the case of a general business corporation, were to be taken into reckoning, the oil shale industry could hardly be said to have big prospects as a paying venture. It would seem, however, that the contemplated investment will be justified by the returns. This is epecially so, since the Scotch experiments found the cost of production to be very much lower than had been calculated by the railway officials."

Mr. M. Umeno, director of the S.M.R. Co., has stated that the question now is whether the shale distilling plant can be commenced on as large a scale as desired by the navy. The navy expects the new experimental factory to be capable of turning out 50,000 tons of shale oil a year, and has proposed to take the whole output at such a price as to cause no loss to the railway company.

" By our own experiments, he said, "the profit on this new enterprise was made out to be 35 per cent. According to the first report from Scotland, the profit margin is put at 15 per cent., which will make the scheme quite possible if the contract with the navy runs for 20 years or longer."

The oil shale at Fushun lies over the immense coal seam and is about 4,000-ft. in thickness containing roughly 5,500,000,000 tons. The oil percentage varies from 10 per cent. to 4 per cent. with the average of 5.5 per cent. The oil is extracted by dry distillation. The total oil obtainable will be 300,000,000 tons, or one-fifth of the total petroleum reserve of the United States. Figuring the total annual consumption of Japan, including what is for naval use, at 1,500,000 tons, the Fushun shale oil may supply the annual wants for 200 years.

The oil shale, that the S.M.R. Co. is planning to work in the open cut zone, amounts to about 500,000,000 tons, from which 2,300,000 *koku* of heavy oil will be obtainable by dry distillation.

Big Supply

The oil shale reserve, if divided according to the different pits, will be as follow:

Open cut	538,843,981
Oyama shaft	712,546,952
Togo shaft	387,698,753
Laohutai pit	601,787,329
Wantawu pit	726,689,171
Hsintun pit	1,108,430,492
Lungfeng pit	1,023,665,734
Talien pit	377,603,005
Total	5,477,265,417

The estimated reserve according to the depths from the surface ground is: Down to 100-ft. deep from the surface ground, 252,000,000 tons; down to 200-ft., 505,000,000 tons; down to 300-ft. 756,000,000 tons; down to 500-ft. 1,223,000,000 tons; down to 1,000-ft. 2,380,000,000 tons; down to 2,000-ft. 3,415,000,000 tons; down to 3,000-ft. 4,932,000,000 tons and down to 4,500-ft. 5,477,000,000 tons.

Fushun oil shale, in spite of its small oil percentage, possesses economically workable value, owing to the following reasons: Its existence in a very thick stratum overlapping the coal seam at accessible depths from the surface ground; availability of cheap labor; abundance of coal for fuel obtainable at a modest price; ample communications and plenty of water for industrial use.

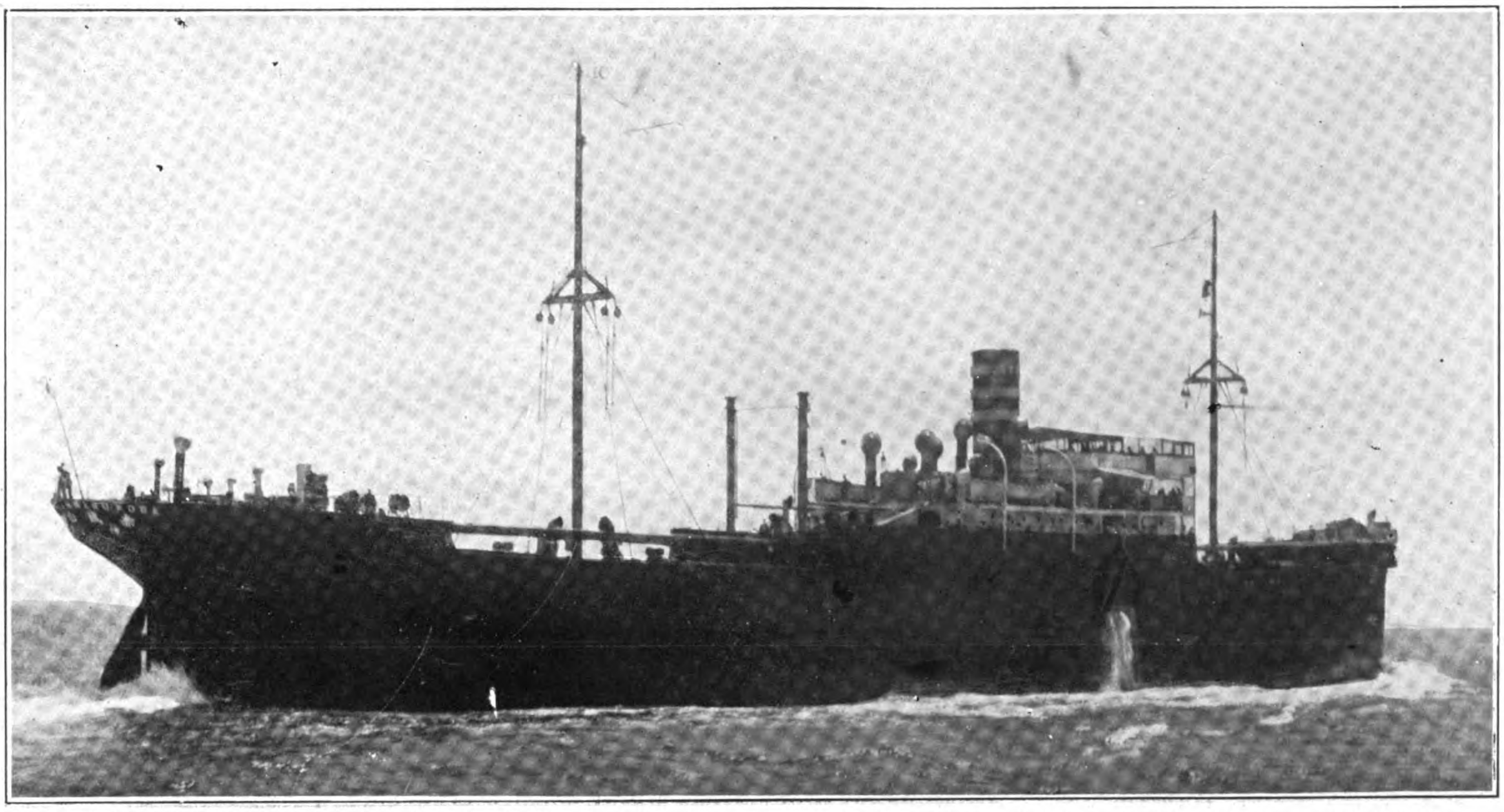
How far this immense shale reserve can be mined awaits fuller study, and the problem must be solved by taking into account the demand for petroleum and the cost of production. In case of these two conditions being favorably met, the exploitation of 2,000,000,000 tons of oil shale is not considered difficult from a technical standpoint.

The New Ambassadors

THE selection of a proper successor to Mr. Hanihara has had the most careful attention from the Tokyo government and from a list of names including Baron Matsui, Viscount Ishii, Ambassador Hioki and Mr. Tanaka, all able diplomats of ambassadorial rank, the choice has fallen on Baron Matsui, the predecessor of Baron Shidehara in the foreign office. Scholarly, dignified, conservative, polished to a high degree, with a personal charm that invites friendship and confidence, added to a profound knowledge of international law, Baron Matsui is eminently qualified to represent his country at Washington and carry through the delicate negotiations interrupted by the resignation of his predecessor. Both Japan and America are to be congratulated on the appointment.

In the same spirit that moved the Japanese government to select its best available diplomat for the Washington post, President Coolidge has exercised unusual care in picking the proper successor to Cyrus E. Woods. In naming Edgar Addison Bancroft as ambassador to Japan, the president has acted as wisely as was possible under our antiquated system of selecting a man for such a major diplomatic post. Such appointments whenever possible should be made from the best equipped men in the diplomatic service but as it is as yet too early to place our new system into practice, the president has been forced to seek a man with special fitness for such a task. Mr. Bancroft admirably fills the requirements. He is a lawyer of national reputation, scholarly and cultivated with broad sympathies and high principles.

His special recommendation for the post is that he will be fair and judicial and meet each question as it arises with an open mind. It is all that both nations can reasonably hope for at this particular juncture, and the fact that Mr. Bancroft has the advantage of starting his diplomatic career with a clean slate free from previous experience and prejudices, will make him freer to do what he believes ought to be done. On this basis, the Japanese extend the glad hand of welcome to the new American ambassador and stand prepared to meet him in the same open and frank spirit which has always characterized their friendship for America.



7,000-Ton Motorship *Akigisan Maru* built by the Ship Building Department of the Mitsui Bussan Kaisha at the Mitsui Dock and Shipbuilding Yards located at Tama, Okayama, Japan

Japan Building Motor Ships

The Mitsui Shipbuilding Yards Completes First Large Motor Vessel Built in Japan

THE popularity of the motor drive in the European shipping industry has spread to Japan where great interest is now being shown in this type of ship propulsion. The general results of this type of vessel in Europe has been very satisfactory, the figures of fuel consumption in most cases being remarkably low. As a result of the more economical operation of the motor ship, the development of new types and the changing of turbine and expansioned engined vessels to motor drive promises to be one of the brightest outlooks for the European shipbuilding industry. Japanese shipbuilders are following this development with great interest seeing in it the possibility for a revival of their own industry while shipowners are equally interested in the operating reports which show that motor vessels earn considerably higher returns on the invested capital than steam vessels.

Setting the example to other Japanese shipping firms, the N Y. K. last year ordered two motor ships (the *Atago Maru* and *Asuka Maru*) from Clyde shipbuilders, the contract for the first mentioned being placed with Lithgow's Ltd. These vessels are of 10,000 tons deadweight capacity with a gross tonnage of 7,500. Their length between perpendicular is 440-ft., 57-ft., moulded breadth and 38-ft. 6-in. moulded depth. There are six cargo holds, one of which is a deep tank, with six cargo hatches and twenty derricks. The member and capacity of these derricks are as follows: Six 10 tons, Six 6 tons, six 3 tons, one 40 tons and one 20 tons. The deck machinery consists of 19 horizontal electric winches and one electrically driven windlass. The steering engine operates a Hele-show Martineau steering gear with telemotor gear complete.

Both vessels have a shelter deck with top gallant forecastle and two continuous decks. The *Atago Maru* launched at Lithgow's yard is engined with two sets of two-cycle single-acting 4-cylinder Sulzer (680 m.m. bore and 1,200 m.m. stroke) Diesel engines. These are of the standard Sulzer construction with separate electrically driven turbo-blowers with the central station for the two motors arranged at the level of the top grating as is customary with the majority of Sulzer equipped vessels. The *Asaka Maru* built by Henderson's is equipped with two sets of four-cycle single-acting 8-cylinder Burmeister & Wain engines. The engines for both vessels are designed to give 4,000 b.h.p. at 100 r.p.m. which gave 15 knots speed on the official trial trips.

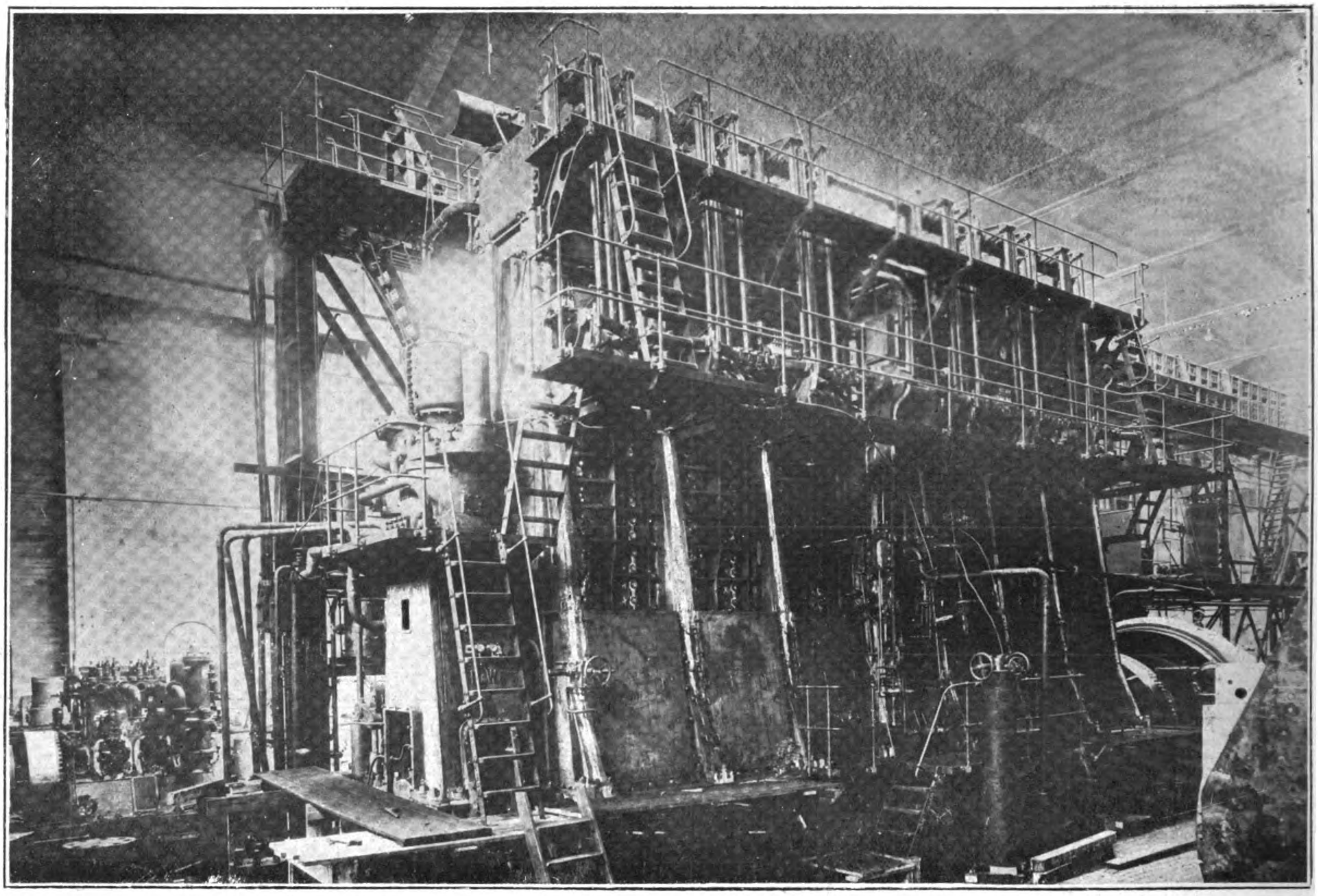
These two sister ships from different builders and equipped with different makes of engines were ordered by the N. Y. K. to obtain comparisons of their performances in actual service.

In the meantime the great Mitsui interests started work on a new motor vessel in their own shipbuilding yards at Tama near Okayama in Japan. These works, operated as the shipbuilding department of the Mitsui Bussan Kaisha were established at the height of the war boom in 1917 and have turned out many excellent ships for the company's fleet and private owners. The yard has two dry docks and several building berths. Their first motor ship, the *Akagisan Maru*, was an unqualified success, exceeding its designed speed by more than a knot. The vessel, attached to the Mitsui fleet on the American run, started on its maiden voyage from Kobe late in July, and has shown itself to be economical in fuel consumption, surpassing the most sanguine expectations of its designers and constructors.

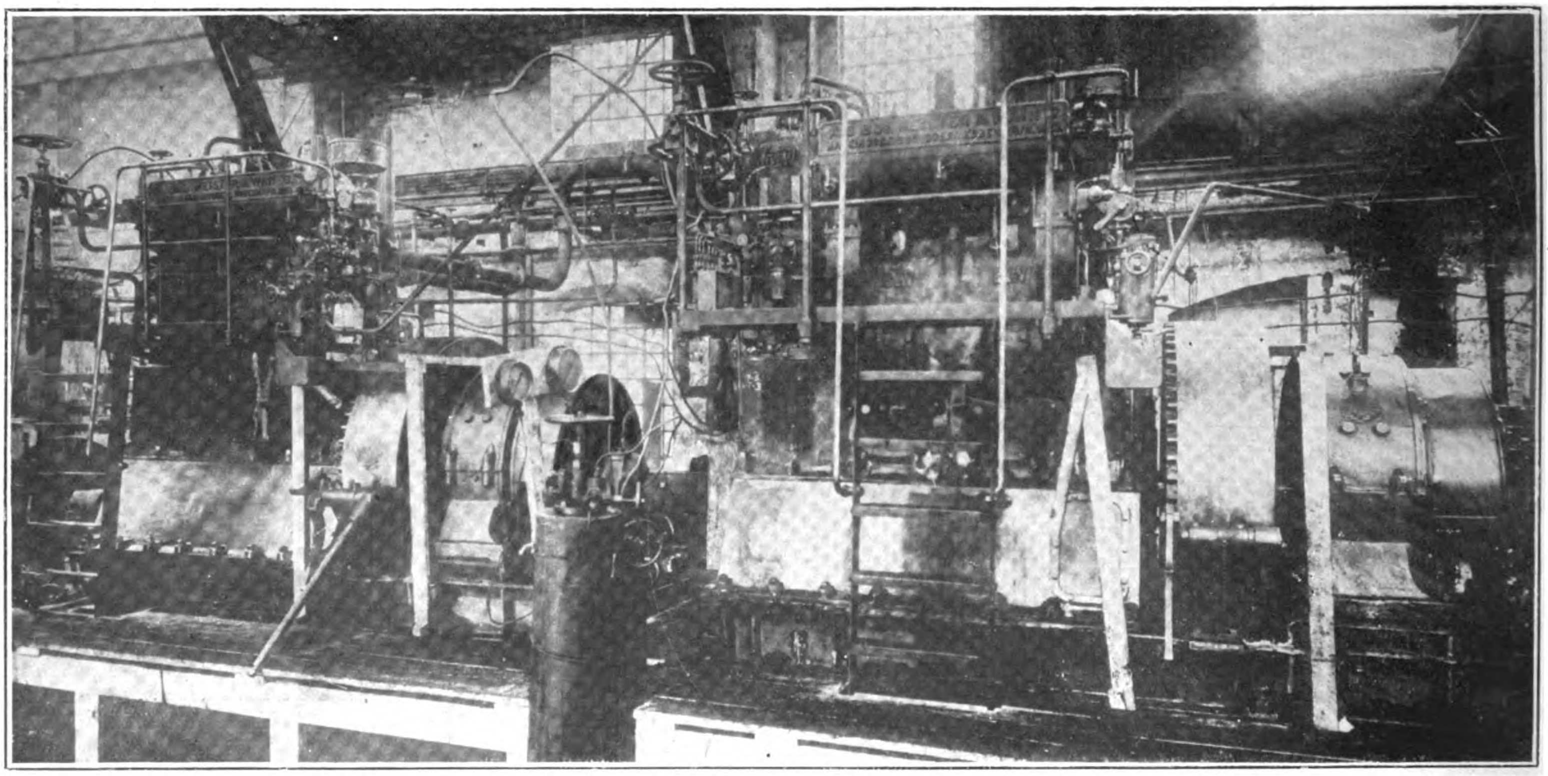
The *Akagisan Maru*, the first large motor ship to be built in Japan, was designed and constructed at the Mitsui yard at Tama under a special Lloyd's survey. It is classed as 100 A1 at Lloyd's and also complies with all the requirements of the Japanese laws.

The principal dimensions of the vessel are: length overall, 389-ft.; length, between perpendiculars, 375-ft.; breadth, moulded, 50-ft.; depth, moulded to upper deck, 30-ft.; depth, of double bottom, 3-ft. 5½-in.; draft, loaded about, 24-ft. 4-in.; gross tonnage, about, 4,630 tons; deadweight, about, 7,000 tons; designed speed, 10.75 knots; fuel consumption per day, about, 7½ tons; b.h.p., 1,800.

The vessel has two complete steel decks, and six water-tight bulkheads. The double bottom is arranged for the carriage of



Main Motor for the *Akigisan Maru* erected in the shops of Burmeister & Wain, Ltd., at Copenhagen, Denmark



Auxiliary Motors for the *Akigisan Maru* in the shops of Burmeister & Wain, Ltd.

oil fuel or water ballast. The total water ballast capacity of the vessel is 970 tons including both peaks, and the oil fuel capacity 720 tons. The five cargo holds have a total grain capacity of 320,000 cubic feet. Each hold except No. 2 has a hatch 24-ft. 9-in. by 18-ft. 0-in. The hatch for No. 2 hold is 30-ft. 3-in. by 18-ft. 0-in. and that for bridge space is 19-ft. 3-in. by 15-ft. 6-in. The cargo handling appliances consist of eight 5-ton derricks which are served by eight 3-ton winches, two $1\frac{1}{2}$ ton on the bridge deck and one 5 tons which is fitted with extension warping barrels. The winches are all electrically driven and were supplied by Laurence Scott & Co.

The steering gear, which was supplied by John Hastie & Co., is of the electric hydraulic type, and is controlled from the bridge by the telemotor. A powerful windlass, which was supplied by Clark Chapman & Co., also is electrically driven. The motor is located under the deck.

In the forward bridge erection, accommodation is provided for captain, deck officers, wireless cabin, chart room, saloon, and steward room. In the deck house round the casing is ample accommodation for the engineers, mess room, and galley. The crew spaces are accommodated forward of the bridge. Electric radiators have been fitted for heating the quarters of both officers and men.

The propelling machinery consists of one six-cylinder, four-cycle single-acting, long-stroke Diesel engine of Burmeister & Wain make, normally rated to develop 2,350 i.h.p. at 87 revolutions per minute (corresponding 1,800 b.h.p.) The daily fuel oil consumption is from 7 to 7½ tons, giving the vessel a cruising radius of about 30,000 miles.

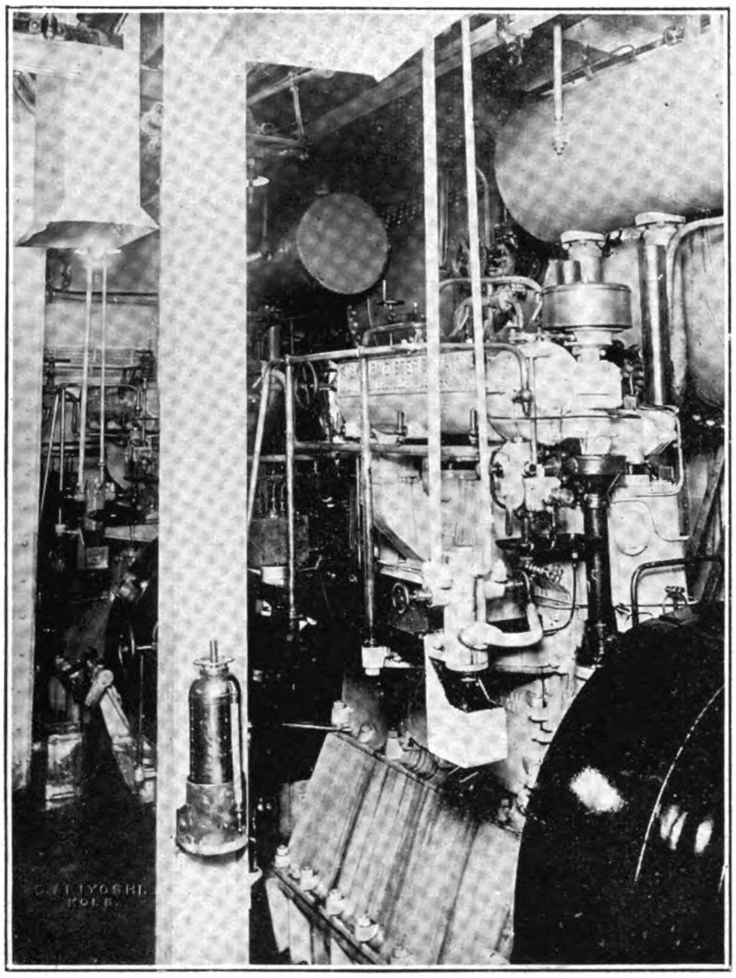
All the auxiliary machinery in the engine room, as well as deck machinery, is electrically driven, current being supplied by the engines were turning at slightly over their rated revolutions. Many influential representatives of shipping and ship building firms were present on the trial trip, as this is the first ocean-going motor ship to be built in Japan. Results obtained during sea trials were :

Oil : Tarakhan Blue Anchor, specific gravity 0.935 ; revolution per minute, 94 ; speed of ship, 12 knots ; pressures-air in l.p. compressor, 1.05 kg./cm.2 ; air in m.p. compressor, 9.49 kg./cm.2; air in h.p. compressor, 60.62 kg./cm.2 ; starting air receivers, 25.85 kg./cm.2 ; circulating water, 1.69 kg./cm.2 ; lubricating oil, 1.25 kg./cm.2 ; air bottles, 60 kg./cm.2 ;

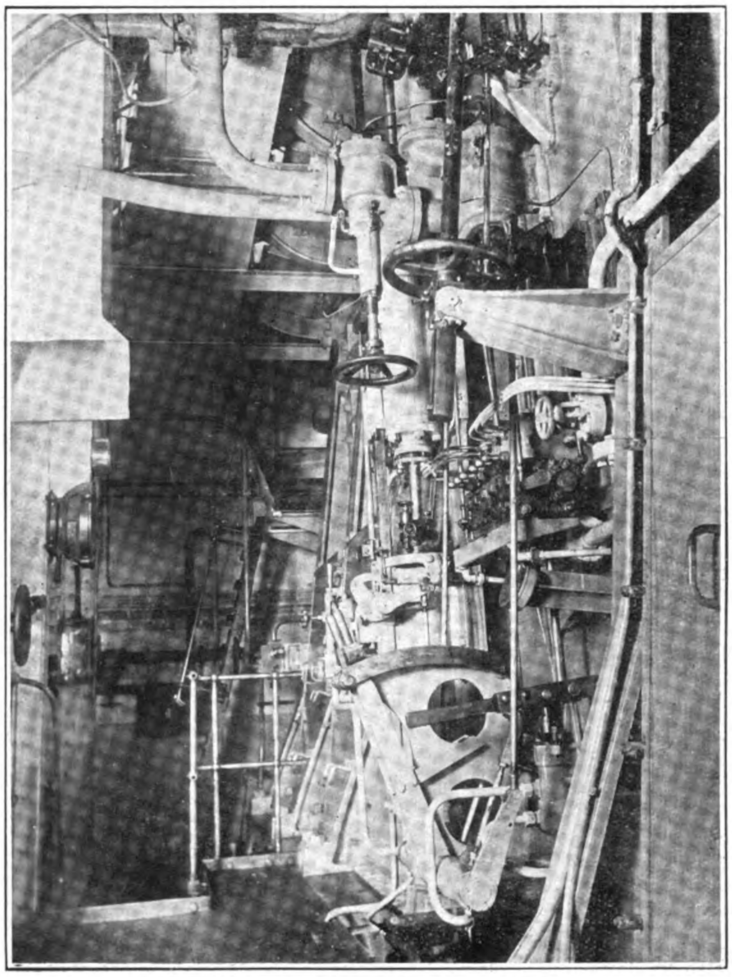
Atmospheric temperature, 27° C. ; engine room, 28° C. ; sea water, 24° C. ; sea water discharge, 53° C. ; cooling water in cylinder cover, 46° C. ; cooling water in piston, 44° C. ; cooling water in exhaust pipe, 53° C.

Lubricating oil temperature at inlet, 29° C. ; lubricating oil at outlet, 34° C. ; fuel oil in settling tank, 30° C. ; exhaust gas at cylinder, 317° C.

Total i.h.p., 2,400 ; oil consumption per i.h.p. per hour including the fuel oil required for the auxiliary engines, 0.131 kg.



Auxiliary Motor installed in the *Akigisan Maru*



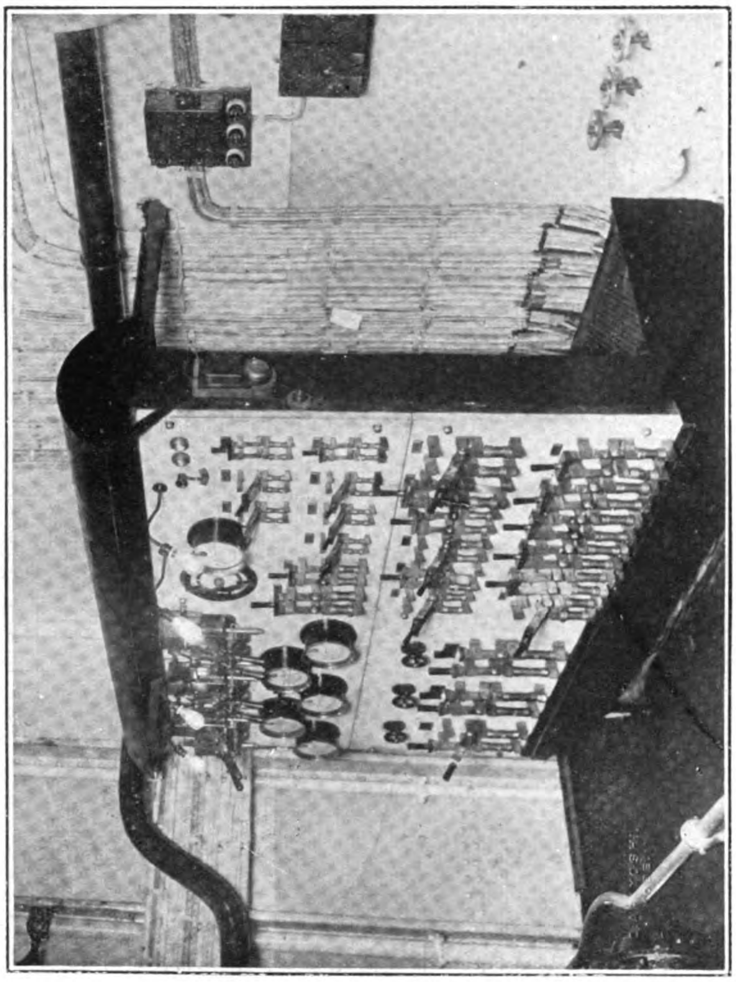
Starting Platform *Akigisan Maru*

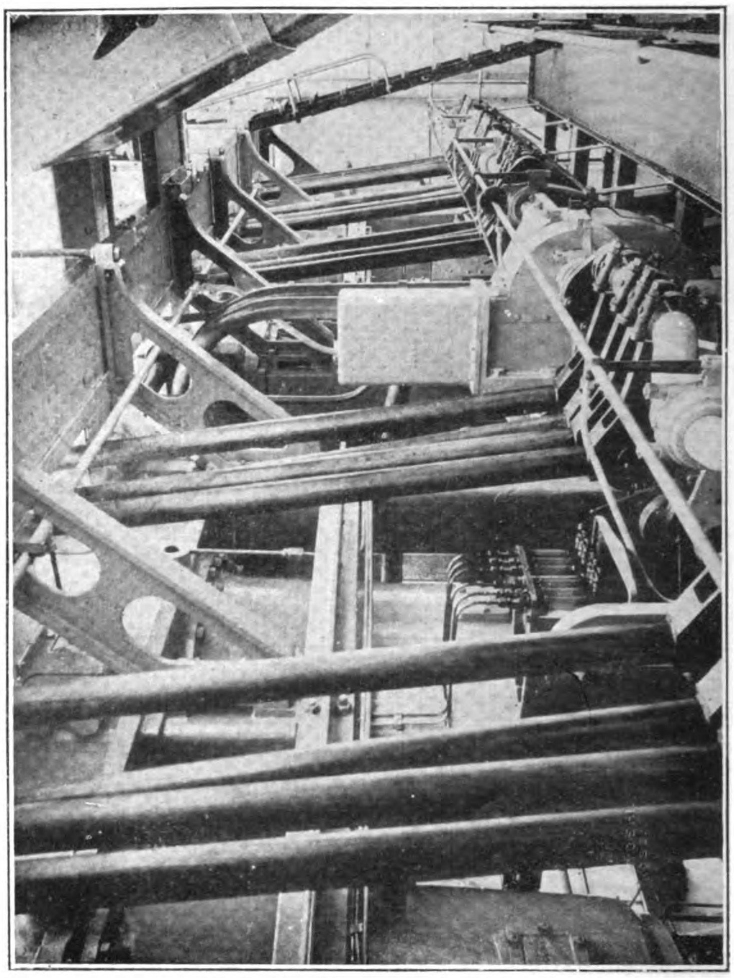
auxiliary Diesel engines of 75 b.h.p. direct connected with air compressors and 50 k.w. generators. There are several pumps, one combined lubricating and daily supply pump, one combined forced lubricating and circulating water pump, one ballast water pump, and bilge, sanitary and cooling water pumps. One donkey boiler, which is fitted with an oil burner, is to be used for leveling work in holds and for the oil fuel in the double bottom. Any one of the dynamos is sufficient to supply the necessary current required for normal working at sea, but two or even all three have to be in operation when the vessel is manœuvring in and out of harbor with the manœuvring compressor, running or when loading and discharging cargo.

The trials of the *Akagisan Maru* were carried out on July 14, on the picturesque inland sea, in the vicinity of the Tama yard. Full speed, reversing, manœuvring and turning circle trials were successfully accomplished. The exhaust from the engines is discharged into a silencer in the funnel, and the complete absence of any sign of the exhaust gas is worthy of note—even when the

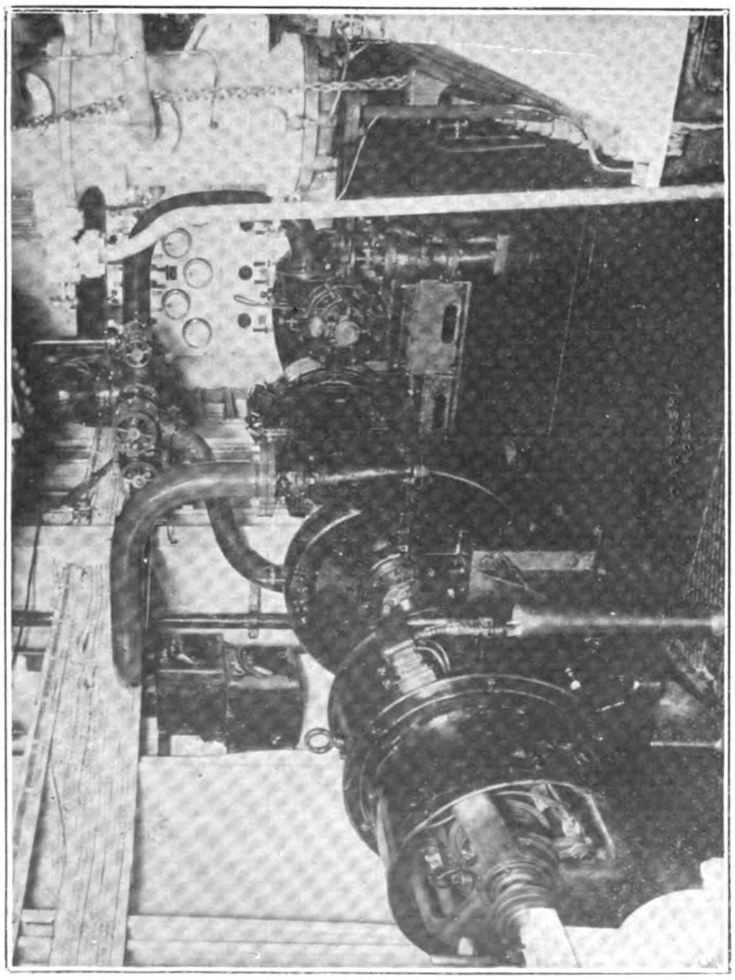
This first motor vessel to be built at a Japanese yard will be followed shortly by the launch of two 9,700-ton deadweight motor ships at the Kawasaki Dockyard at Kobe to the order of the Kawasaki Steamship Company. The first of these vessels, now nearing completion, is 405-ft. in length b.p., with a beam of 53-ft. and a depth of 37-ft., and engined with a Camellaird-Fullagar type engine, constructed by John Brown & Co. It is a six-cylinder set, with cylinders 22 inches in diameter, the stroke of each piston being 33-in. The output is 2,500 b.h.p., with a speed of 98 r.p.m., while the normal speed of the ship will be in the neighborhood of 11 knots.

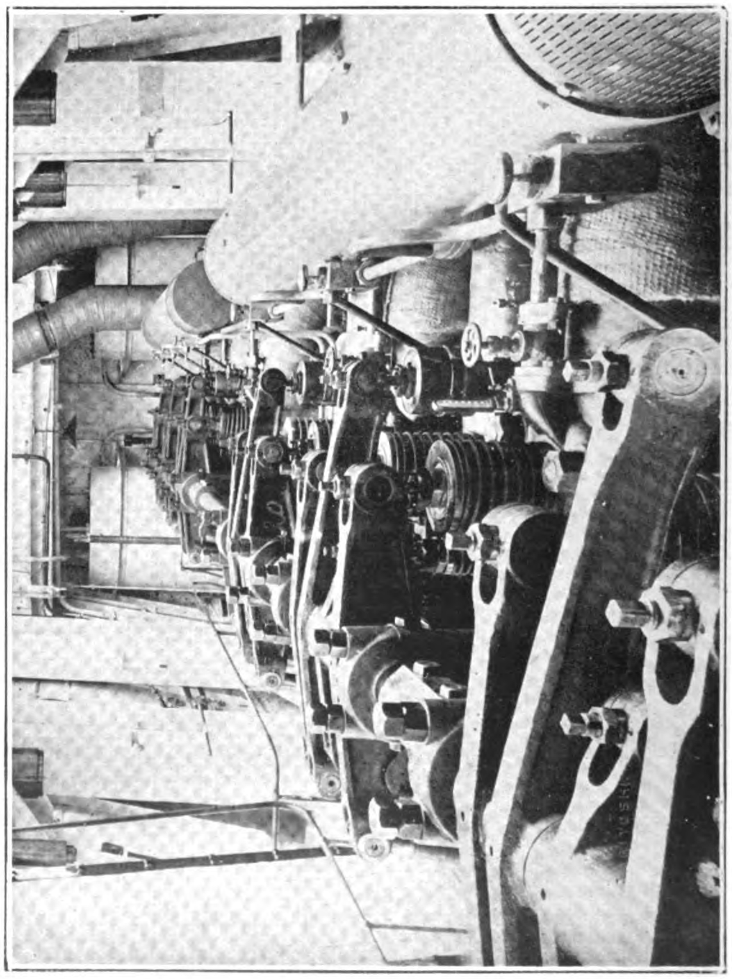
These two motor vessels for the Kawasaki Steamship Company are to be followed by two more for the same company to be added to the motor ship fleet of the Roosevelt Steamship Company, an enterprise organized last year between the American company and the Matsukata interests in Japan. Under the new arrangement the Roosevelt Steamship Company was to contribute five new motor vessels built in British yards and the Japanese four similar vessels to be built in Japan at the Kawasaki yards. The





Top: Switchboard
Bottom: Cam Shaft of Main Engine





Top: Combined Lubricating Oil and Cooling Pump and Ballast Pump
Bottom: Top of Cylinders

MOTOR SHIP *AKIGISAN MARU*

first of these new vessels was dispatched on her maiden voyage from London to the Far East via the Panama Canal in July last.

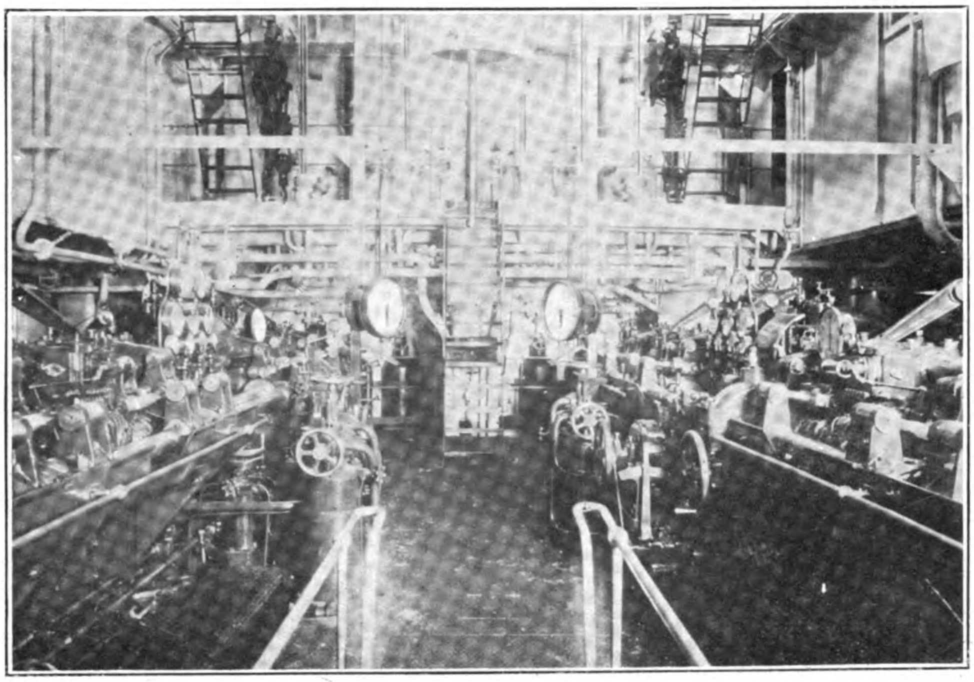
The British motor ships for the Roosevelt-Matsukata fleet are called the *Silver Elm, Silver Cedar, Silver Fir, Silver Pine* and *Silver Larch* all of 8,000 tons deadweight. The first three were built at Doxford's yard in England and equipped with Doxford engines. The two last vessels are of 8,500 tons deadweight fitted with the Neptune engine and are being built by Swan, Hunter and William Richardson, Ltd.

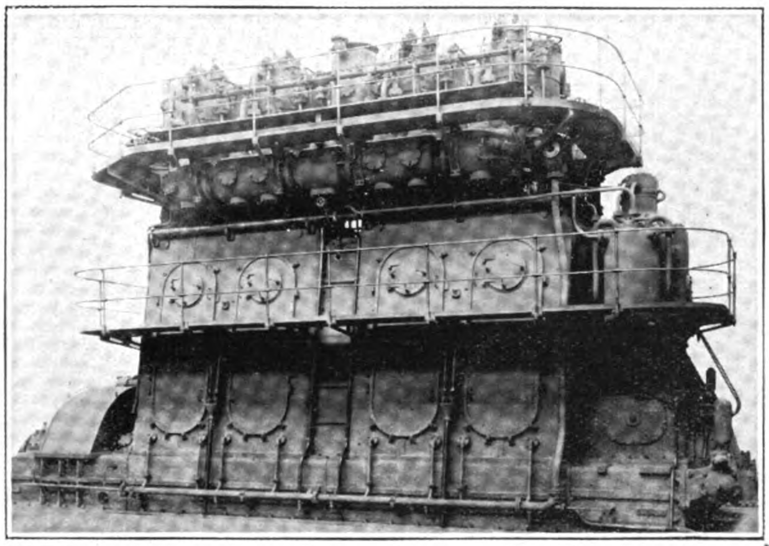
An outstanding feature of these motor ships is their very large cubic capacity, which consists of 535,000 cubic feet bale space. The guaranteed speed is $10\frac{1}{8}$ knots, and the consumption is about $8\frac{1}{8}$ tons of oil for the main engines, with about 2 tons for the auxiliaries. This new service represents in a very practical way the arrival of the motor cargo vessel.

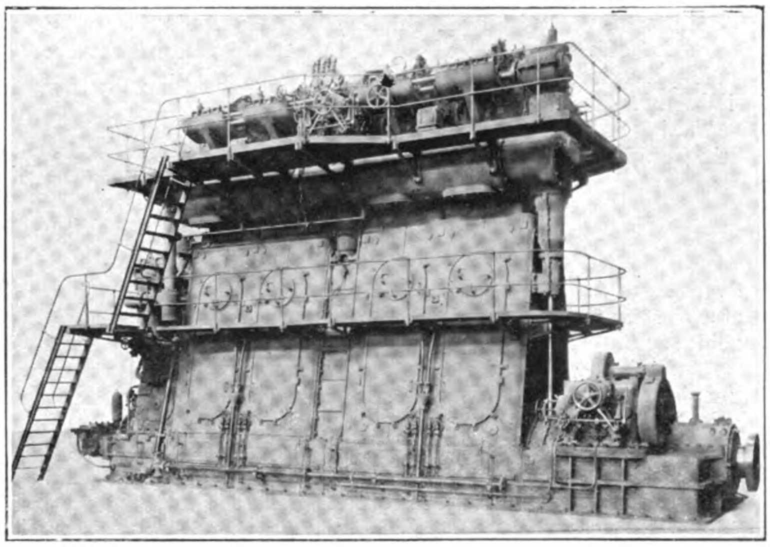
After a few voyages with vessels in the new fleet some very interesting data ought to be available to use in comparison with this service when it was entirely maintained by steamers.

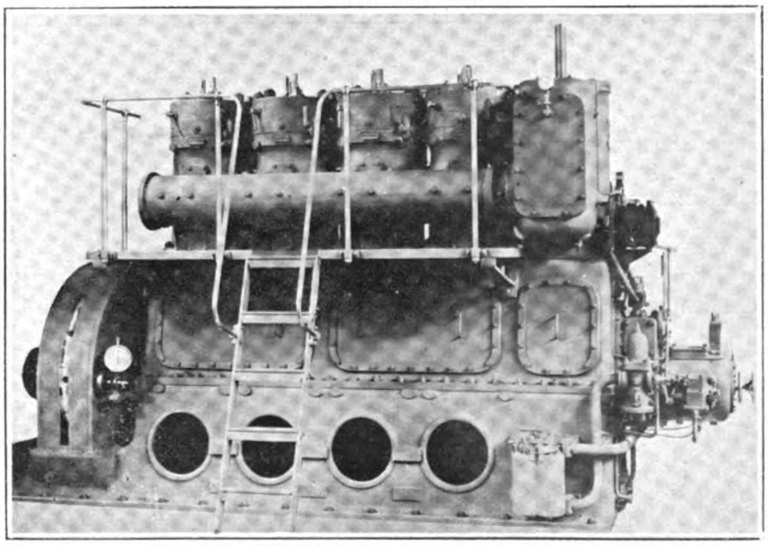
The British end of the Roosevelt-Matsukata combination is the old and well-known Kerr Steamship Company, Ltd., which entered into the original arrangement with the Japanese for a round-the-world freight service using the steam vessels of the Kerr and K. K. K. lines. The decision to change the fleet over to motor ships was based on a cut-and-dried-business arrangement. It was found that the steamships were running on the dearest coal bunkering route in the world. At Panama, coal is about 48s. a ton. At other points coal has to be shipped out from British ports. It meant that a steamship service there was an absolute loss, and compelled the operators to turn to the Diesel engine. The new motor vessels will get all their fuel oil at San Pedro, in California, and 900 to 1,000 tons of oil, stored in double bottoms, will take one of these vessels from New York to Japan and back again, whereas 1,600 tons of coal were necessary for the voyage simply from New York to Japan. These figures show how big a saving in space the change to motor ships means. The steamers used 35 tons of coal per day, and the motor ships will use about $7\frac{1}{2}$ to 9 tons of oil per day.

There is also considerable talk about changing the drive of several large Japanese steamships from turbine to Diesel engines and some time ago it was said that the Toyo Kisen Kaisha would convert the *Tenyo* and *Shinyo Maru* to oil engined ships. It is understood that the order for the engines has already been placed in Germany, but no details are available nor have the vessels yet been laid up for the conversion to be carried out. The total power needed will be about 12,000 h.p. and it is









THE SULZER INSTALLATION ON THE N.Y.K. MOTOR SHIP *ATAGO MARU*

Top: **Control Station**

Centre: **Front and Rear View of 2,000 B.H.P. Sulzer Marine Diesel Engine**

Bottom: **250 B.H.P. Sulzer Auxiliary Marine Diesel Engine with Scavenging Pump without Compressor**

believed that high speed engines will be utilized, probably in conjunction with mechanical gearing.

The Mitsubishi Shipbuilding yards are also building and equipping motor vessels and although there is no direct information about their plans the London newspapers state that two marine heavy oil engines of 600 h.p. each, were recently ordered through the Mitsubishi Trading Company from Vickers, Limited. These engines are repeat orders for similar ones sent to the Mitsubishi yards some time ago and are of the four-stroke cycle crosshead type, with six cylinders 18½ inches diameter by 27-inch stroke operating at 150 r.p.m. These engines are evidently intended for the three new vessels now under construction in the Mitsubishi yards to the order of the Osaka Shosen Kaisha.

The Osaka Shosen Kaisha is operating the *Ondo Maru* and *Kurenai Maru*, both with motor engines, in its Inland Sea service. The *Murasaki Maru*, a sister ship, was fitted with a steam engine and the comparative performances of these three ships is being studied.

It is generally considered that motor-driven vessels are better for passenger service and are faster. Also, the operating expense is about half that of steam engines, it is declared. The result is that several of the large shipping companies are constructing the new type of vessels.

Tonkin Culm as Pulverized Fuel

Early Difficulties Overcome by French Engineer

HOW to make use of culm for heating boilers is the subject of an interesting study in which Mr. M. Raby, mining engineer and chief of the bureau of mines in French Indo-China recommends pulverized anthracite in order to realize important savings in industry.

Taking as a basis some studies made in France by Mr. Sagallier, mining engineer in Grenoble and the results he obtained during experiments he made in Tonkin, Mr. Raby concludes that it has been possible to burn to best advantage, coal dust which on analysis shows 14 per cent. volatile matter and 41 per cent. ashes.

The first attempts made in Tonkin as regards making use of pulverized anthracite as fuel for boiler furnaces did not give satisfactory results. Experiments were recently made with some new machinery and it looks as if the problem had now been solved.

Unwashed culm run through a sieve in order to have a maximum size of 10 millimetres was used to that effect. It was supplied by the Sociêtê Francaise des Charbonnages du Tonkin.

This culm in fact is a fuel of high heating power, giving but little residue in ashes and seems at first to be of better use than Alpine anthracite on which interesting studies have lately been made.

The installation which served as an experiment was intended to heat a Babcock-Willcox boiler of 150 square metres heating surface ; it consisted of only one machine of the turbo-pulverizer type. The coal introduced by hand into a feeding box went to the distributor and was then crushed in a pulverizer composed of three disks with paddles made fast on a shaft turning at 1,750 revolutions per minute. A ventilator adapted on the same shaft drew the pulverized coal and carried it to the burners.

The results obtained were very satisfactory and, according to the report of the owners, the cost price of steam produced by heating with pulverized coal is considerably lower than steam made in boilers with stationary grates ; taking into account the cost of upkeep due to replacing frequently certain parts of the turbo-pulverizer.

Owing to the economic development of the colony, the local consumption of fuel increases in greater proportion than does the output. Indo-Chinese manufacturers in making use of the new heating process by pulverized anthracite would bring about a more favorable situation. Manufacturers, however, have up till now been in the habit of using a graded product and the culm which is being mined in large quantities by the local companies, is mostly exported. The statistics of 1922 show the following figures :—

Total production of the coal mines in Tonkin	989,000 tons
Total exports	536,000 tons
Local consumption	453,000 tons
Exports of graded coal from Hongay ..	109,000 tons
Exports of culm	397,000 tons

It would be to the interest of the colony if this situation came to an end and that the home market absorb the production of anthracite culm which up to the present time has been exported.

The new process of heating requires the acquisition of pulverizing machinery and also the transformation of existing installations, but the results obtained show that in the aggregate these expenses are more than compensated by the lower production cost of steam in making use of low-priced fuel.

It must be said that during the experiments made in Tonkin, only Hongay culm was used ; this has a very small percentage of ash. The selling price of this culm ($5.80 f. o. b. Hongay) is rather high in comparison to anthracite culm from the Dong-Trieu mines which sells as low as $2.50 (spot Haiphong) but has a high percentage of ash, 15 to 20 per cent. It is not likely that difficulties would be encountered due to the inferior grade of fuel, as such coal is now being used in the Alps, the percentage of ash being not less than 18 per cent. and sometimes as high as 35 per cent.

The use of culm having a high percentage of ash would benefit the buyers as well as the producers who might then be induced to work certain coal beds considered until now as too poor in graded coal.

The process of heating with pulverized coal is bound to be developed in Tonkin and should also be of interest to manufacturers of the other states of the union, particularly Cochin-China ; this market, which is solely dependent on importations, took in 1922 61,000 tons of coal, 56,000 being anthracite from Tonkin.

Owing to the general increase in demand there are difficulties in supplying the Saigon market, so much so that recently certain buyers were obliged to secure coal from the Dutch Indies at the price of $15.50 per ton delivered Saigon. If one considers that freight rates from Hongay to Saigon can be obtained at $3.50 per ton, for a minimum of 2,000 tons, it seems that culm from Tonkin costing not more than $9.50 delivered Saigon, would be of great service to the local industry.

It is to be hoped that in view of the good results obtained, the manufacturers of French Indo-China will gradually come to use Tonkin anthracite culm in pulverized form, and that the development of this heating process, in bringing about lower manufacturing costs and to the miners larger opportunities of selling a hitherto neglected product, will be the source of a new economic impetus to the colony.

Bagasse Made into Boards

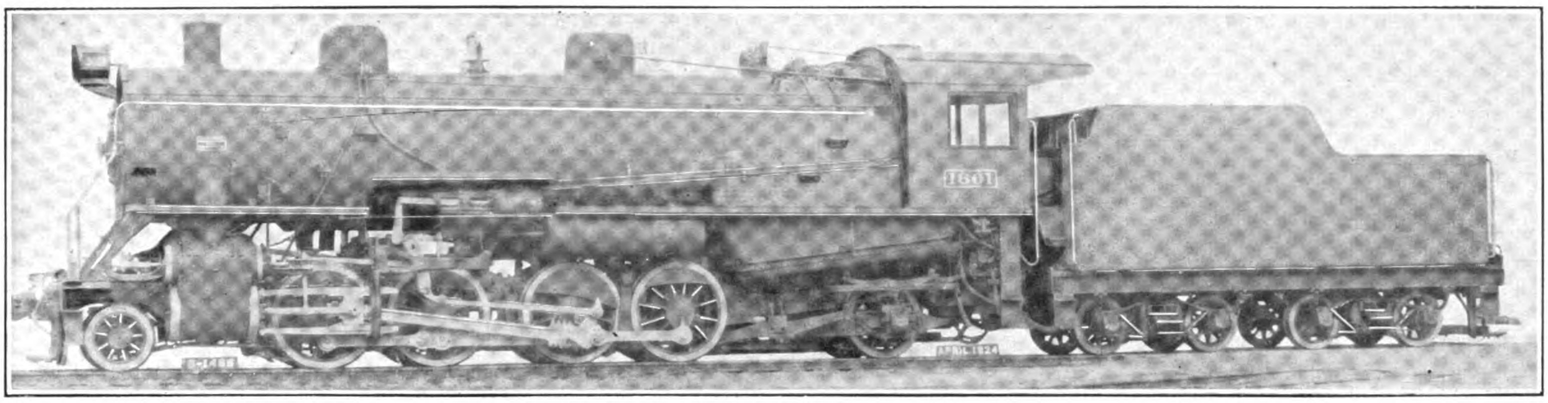
As romantic as " making two blades of grass grow where only one grew before " is the achievement of a group of paper workers, lumber men and chemists of Minnesota, U.S.A., who have just worked out a process whereby one of the liabilities and nuisances of sugar plantations has been converted into an asset capable of producing revenue amounting to a million dollars a year.

The waste product which has been thus transformed is bagasse, the fibrous residue of sugar-cane after the juice has been extracted. Formerly this substance was burned under the boilers of the sugar mills, not because it is a good fuel, as it isn't, but because there was no other way to get rid of it.

By the process just perfected, the bagasse is fed into a cooker, where it is combined with chemicals and small amounts of old newspapers, and then as a pulp is fed into rolls and finally into an enclosed drier, coming out at the end an absolutely dry board. Its commercial possibilities are several. It is used in refrigerator cars and cold storage warehouses, in the manufacture of fireless cookers as insulating material, and, most of all, in the building of dwelling houses, where it serves as sheathing, plaster base and wall.

Electric drive is used throughout in the big plant at New Orleans which turns out this product and which represents an investment of $2,000,000. The power equipment, built by the General Electric Company of America, comprises a 2,500 kilowatt turbine generator, a thirteen panel switchboard, and a miscellaneous installation of motors for driving the various units, aggregating about three thousand horse-power.

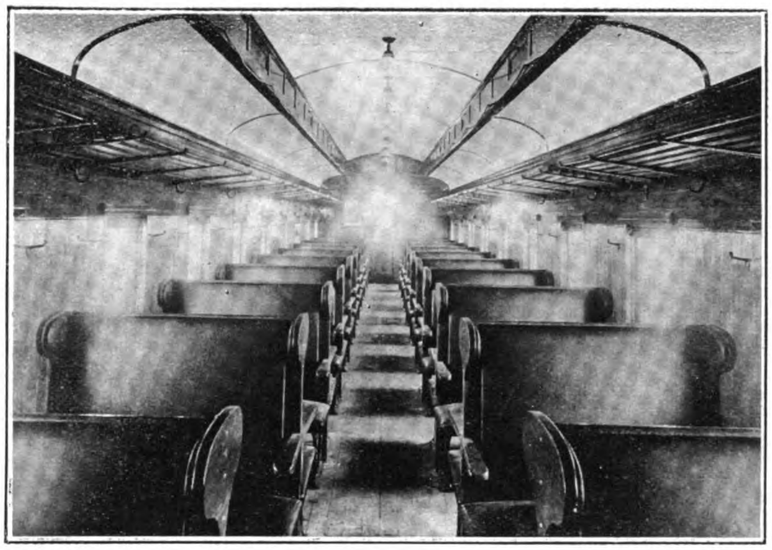
The effect of this constructive process in making something worth while out of former rubbish is to save thousands of dollars to the planters, create thousands of tons of freight for railroad and steamship lines, and reduce the cost of building operations.

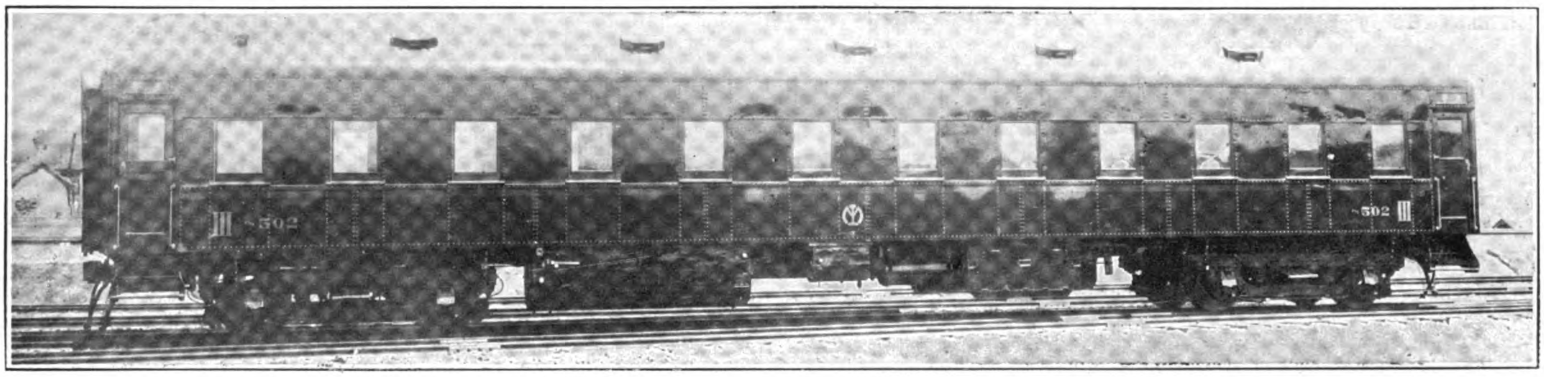


Three Cylinder Tender Type, 8-wheeled Locomotive for the South Manchuria Railway built at the Schenectady Works of the American Locomotive Company

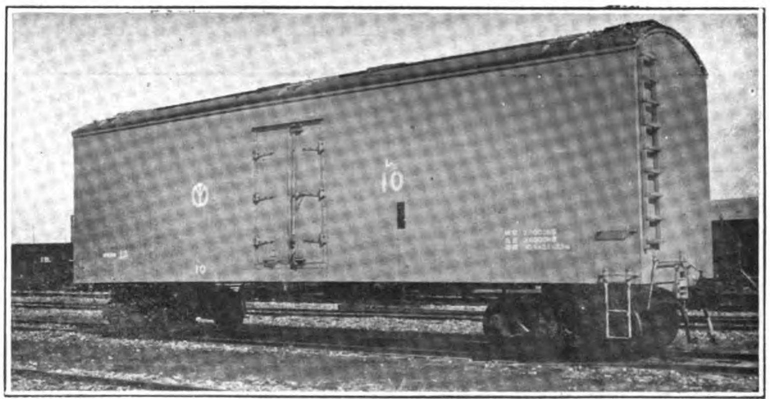
Three-Cylinder Locos and All-Steel Cars for the S.M.R.

IN our last number appeared an illustration of the new all-steel cars for the Kobe municipal tramways now under construction at the Tanaka Iron Works in Osaka. The imperial Japanese government railways is also conducting investigations with the view of superceding its wooden passenger coaches with all-steel cars on the main lines of communication and is watching with considerable interest the experiments made by the South Manchuria Railway Company whose great shops at Shakako near Dairen has built several of this type for their own use.





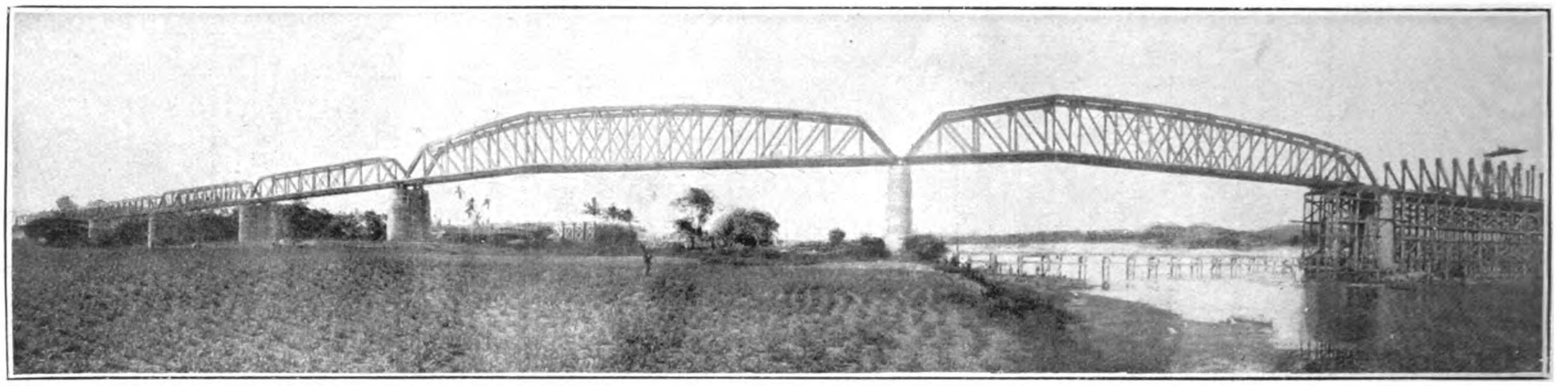
These shops are fully equipped for turning out this class of work and as an experiment four were originally built under the supervision of Dr. Yokui, director of the shops, and their operation carefully watched by the operating department of the railway. These first experimental all-steel coaches were found to be unsuited in some respects for the climate and certain modifications were made in the newer cars which are now proclaimed eminently suitable for the traffic. For the present, however, under prevailing economic conditions with its high costs of manufacture, the cost of constructing these all-steel cars in the Shakako shops is slightly higher than the cost of importing them from foreign makers, so there is no immediate intention on the part of the S.M.R. authorities to build further coaches of this type at their own shops. Our illustration show the exterior and interior of the standard third-class passenger all-steel coach turned out by the Shakako Works and we also reproduce the illustration of a new type of refrigerating car for the S.M.R. built at these shops. This type of car was also designed by the S.M.R. engineers to keep in close touch with the developments of the cold storage traffic in meats and fruits from Manchuria for the Japanese market. The peculiarity of these cars is that they can be converted at will into refrigerator or santhermic cars. On their trial test the temperature inside the car was maintained at 4 deg. C. while that outside stood at zero. The interior of the car is lined with asbestos. Several of this type have been turned at Shakako and are in service for transporting fruits and other perishables susceptible to freezing temperature.



Interior View of Third Class All-Steel Passenger Coach Built at the Shakaku Works of the S.M.R.
Exterior of Third Class All-Steel Passenger Coach
Refrigerator Car for the S.M.R.

In April of this year the S.M.R. ordered from the American Locomotive Company five

(Continued on page 497.)



The Guillemard (Kelantan) Bridge from Down Stream Side, South Bank

Federated Malay States Railways in 1923

MANY noteworthy improvements and extensions were made in the Federated Malay States Railways during 1923. Among them were the opening of the Guillemard Bridge on the Kelantan section of the east coast line, the completion of the Jelai bridge on the Pahang section, the opening of the Johore causeway and the first train service on the new Penang hills railway. The working of the railway produced a net profit of $1,710,349 as compared with $2,004,005 in 1922, this year's profit being a return of 0.89 per cent. on the capital expenditure of $191,975,106. The expenditure on new lines was $2,042,034, and for widenings and additions, including the Johore causeway and new wharves at Prai was $4,746,750.

The receipts from all sources were $14,675,106 an increase of $858,782 or 6.22 per cent. Against this is charged expenditures of $12,964,757 an increase of $1,152,438 or 9.76 per cent. Passenger traffic increased by 2,217,051 or 26.7 per cent. over 1922. Parcels and goods traffic also showed a substantial increase of $795,733. The mileage was 1,044, a gain of 22 miles. Fuel costs were $97,000 higher, but this is largely offset by the decrease in lubricants of $71,000. Fuel costs per engine mile were 30 cents a mile, an increase of one cent over the previous year, but the total running costs per engine mile are 51 cents as compared with 53 cents in 1922.

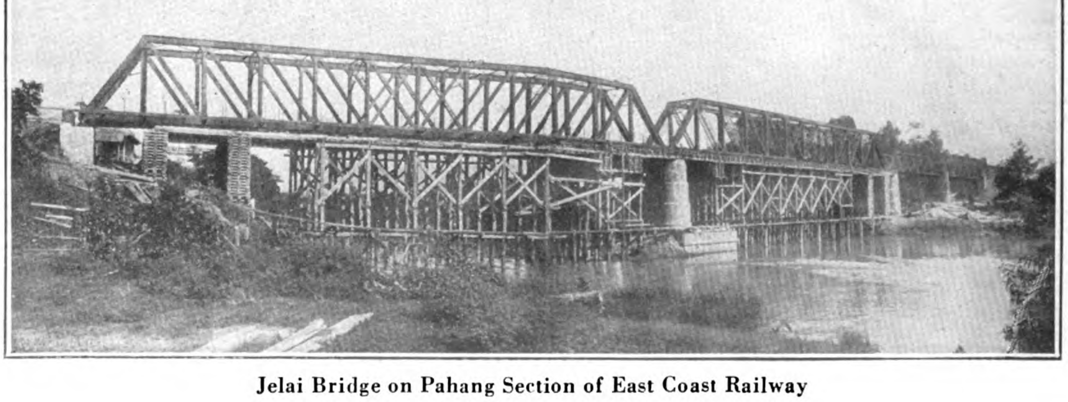
One of the interesting features of fuel costs is the comparison between the wood of the mangrove type and that of the jungle as against imported coal. The railways are in a position to make this comparison as they have both types of engine constantly at work. Mr. Anthony figures that "bacau" or mangrove wood is required to the extent of two and one-half tons for one ton of imported coal. Jungle wood, however, is only one-third the value of the coal. The railways also use Rawang coal which is used in the proportion of 1.66 tons to one ton of imported coal. The fuel consumption works out at 66.51-lbs. per train mile as against 66.62-lbs. in 1922, considered in terms of imported coal.

The running line was maintained at a cost of $151.82 a mile per month, and the total maintenance cost was $233,700 more than a year ago. The total engine mileage including maintenance mileage was 5,028,925 a gain of some 200,000 miles due to additional train service.

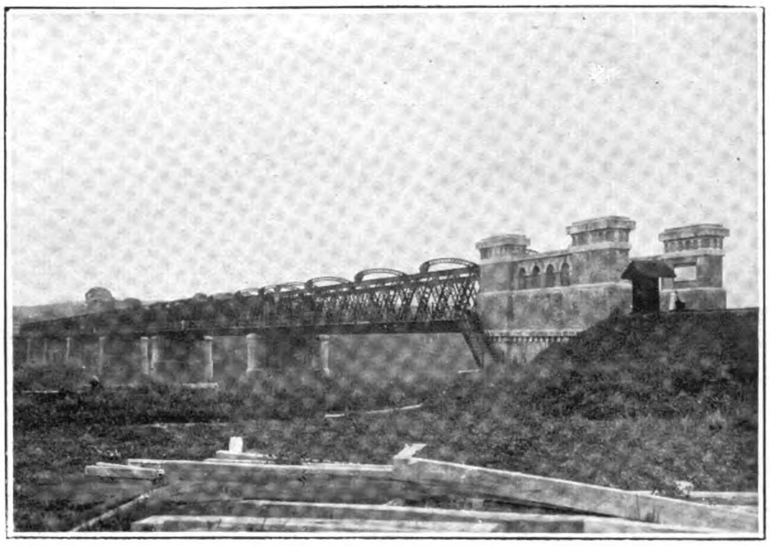
The railway administration has been concentrating on the east coast line of which the principal sections are the Kelantan and Pahang ones. The Kelantan section starts from Tumpat and proceeds southwards towards Kuala Lipis in Pahang, the distance from Tumpat to the Pahang-Kelantan boundary being 140¼ miles. The line from Tumpat to Tanah Merah (32 miles) was opened for traffic on July 1st, 1915. All necessary land has been acquired to the Pahang boundary from Tanah Merah. Felling and clearing have been completed as far as the 89th mile. Main line earthwork between Kuala Krai and Manek Urai is completed, except for gaps left for culverts and bridges. Between Manek Urai and Kuala Pergau the work has proceeded slowly for want of funds. Six hundred thousand two hundred and six cubic yards of earth, and 120,557 cubic yards of rock have been excavated for main line, 33,526 cubic yards in stream deviations and 82,800 cubic yards in station yards. Rails have been laid as far as the 61st mile. The line between Tanah Merah and Kuala Krai is approaching completion, the only works of any size remaining to be completed being Kusial station and three bridges.

One of the most important works on this line is the Guillemard bridge which was opened with great ceremony on July 23rd, 1924. The bridge is named in honor of Governor Sir Laurence Guillemard, who cut the cord that bound it with a golden kris presented by the Sultan of Kelantan.

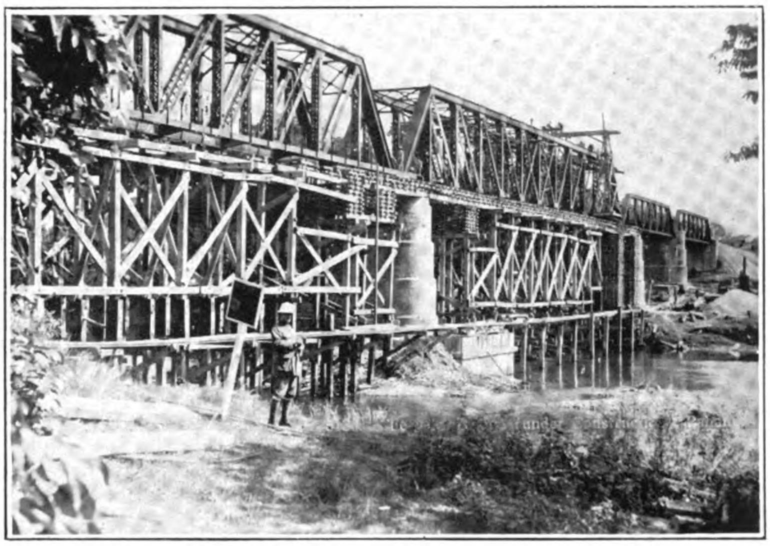
The total length of the bridge, including the approaches, is 2,160-ft., and it consists of five spans of 250-ft. each and five spans of 150-ft. each. The normal width of the river is 1,050-ft., but it widens out in flood time to 2,080-ft. The depth of the river varies from nine feet to 40 feet. The height of the beam of the girders above the river-bed is 55-ft. The total weight of the steel work which has gone to make the bridge is 2,800 tons. The abutments and piers are all founded upon wells which, in some instances, have been sunk to a depth of 57-ft. below the river-bed in order to secure good foundations. The construction work began in April, 1920, and was completed in April, 1924. It is the longest bridge in the Malay peninsula and longer than any in Siam, being longer even than the bridge over the Menam near Bangkok, of which an account appeared in the September issue of THE FAR EASTERN REVIEW. The bridge was designed and carried out entirely by the construction department of the F.M.S. railways.



Jelai Bridge on Pahang Section of East Coast Railway



Victoria Bridge over Perak River at Enggor



The Jelai Bridge over the Pahang, under Construction

Seven other small girder bridges and all foundations, piers and abutments for the Nal bridge were also completed during the year. The expenditure amounted to $1,702,132.

The East Coast Railway, Pahang section, was opened for traffic as far as Kuala Lipis ($141\frac{1}{2}$ miles from Gemas) in October, 1917. The section from Kuala Lipis to Padang Tungku, five miles 49 chains in length, was opened for traffic on the 16th March, 1921, and the section from Padang Tungku, mile $147\frac{1}{2}$, to Chigar Perah, mile $163\frac{1}{2}$, was opened for traffic on 15th November, 1923. The work now in progress commencing from Chigar Perah runs northwards towards Tumpat. The distance from Chigar Perah to the Pahang-Kelantan boundary is 24 miles and the total distance Chigar Perah to Tumpat is 164 miles. The distance from railhead, Pahang, to railhead, Kelantan, is 98 miles. During the year 38,865 cubic yards of earthwork were executed on the main line and 14,026 cubic yards in stream diversion of which 695 cubic yards were rock. Two thousand six hundred and forty-six cubic yards were done in station yards and 16,002 cubic yards on account of slips. The Jelai bridge, which is the largest on the section, consists of two spans of 200-ft. and two of 100-ft. Considerable difficulties were experienced in the mid-stream foundations, but the bridge was completed early in November, 1923.

Messrs. Topham, Jones and Railton, Limited, contractors for the Prai jetty, wharves, etc., commenced work in May, 1918. The land works under this contract including the blockwork wall with the exception of the gap left opposite the old Prye Dock, were completed. Unexpected difficulty was met with in dredging owing to the excessive siltage.

The contract for the causeway across Johore Straits was let to Messrs. Topham, Jones and Railton, Limited, who commenced work in June, 1919. The lock at Johore was taken over by the Federated Malay States Railways on the 1st January, 1923, and has been in regular use by shipping since that date, the total number of craft passing through the lock during the year being 13,513. The rolling lift bridge, carrying the railway and roadway across the lock, was completed, the operating cabin was erected and the electrical operating and controlling gear was installed and connected with the Johore power station. On the opening of the causeway for railway traffic the wagon ferry power house and the landing stage on the Johore side of the Straits were dismantled and removed to allow the east and west wing walls of the lock to be completed.

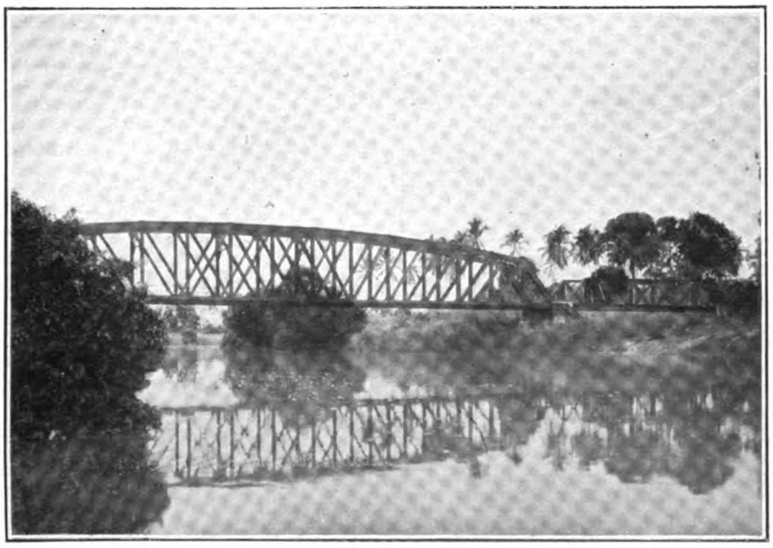
The Penang hills railway† line was completed and opened for passenger traffic on 21st October, 1923. This railway was handed over to the colonial government as from 1st January, 1924, and is being operated by the Penang municipality.

Three-Cylinder Locos and All-Steel Cars for the S.M.R.

(Continued from page 495.)

three-cylinder locomotives the first of their type to be used in Asia. These are now being delivered and will be placed in operation this month. The type is known as a "Three-cylinder 8-wheeled tender locomotive and are built to the following particulars :—

Gauge, 4-ft. $8\frac{1}{2}$-in. ; cylinders, $22\frac{1}{2}$-in. d. by 26-in. stroke ; driving wheel diam., 54-in. ; boiler, inside d. 80-in., pressure, 180-lbs. ; fire box, length, $114\frac{1}{8}$ -in., width, $84\frac{1}{4}$-in. ; tubes, No. 245-42 ; diameter, 2-in.-$5\frac{3}{8}$-in., length, 18-ft. 6-in. : wheel base, driving, 15-ft.-10-in. ; engine, 34-ft. 2-in., engine and tender, 62-ft. $7\frac{1}{4}$-in. ; weight in working order (pounds) leading, 21,000 ; driving, 194,000 ; trailing, 48,500 ; engine, 263,500, tender, 135,500. Heating surfaces (sq. ft.) tubes, 2,361 ; flues 1088, fire box 217, arch tubes, 29, total 3,695 ; superheater, 945 ; fuel, soft coal ; grate area, 66.8 sq. ft. Maximum tractive power, 56,000-lbs. ; factor of adhesion 3.46 ; capacity, water, 6,000 gals., fuel, 10 tons.



The Kedan Bridge

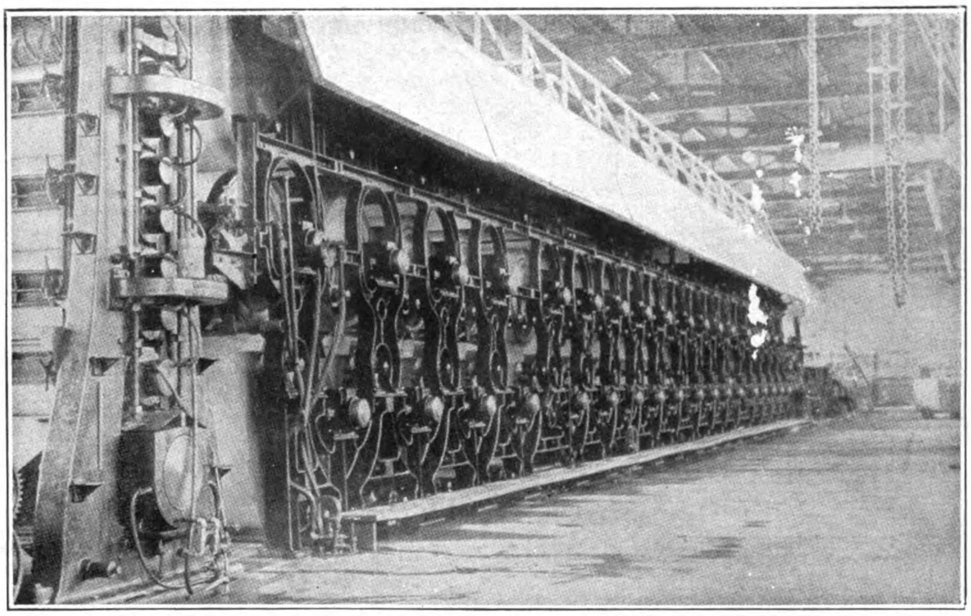
Lipis River Bridge, Pahang

China Begins Strawboard Manufacture

Potential Source of Wealth Now Destroyed to be Turned Into Dollars by Modern Paper Mill Machinery

SEVERAL million tons of rice straw are burned or go to decay in the oriental section of the world every year and this waste product, in fact, is a serious problem in some localities where it is piled up and allowed to decay, furnishing breeding places for beetles and other noisome creatures, for the discomfort of the dwellers roundabout until they are goaded to apply the torch when no purchaser appears to take over an asset that finally becomes a serious liability. Yet this straw whose value in even the most sanguine of Chinese minds, is some 40 cents a picul, is a potential source of wealth and if turned into strawboard can be sold for $100 a ton. The cost of conversion is not so great either, only the capital required to instal even a 20 ton mill is considerable and that naturally acts as a deterrent in the minds of the villagers who still think in cash and whose eyes are blinded to the distant dollar by reason of the near-by cent.

To those who know China and the consummate ability of the Chinese to extract the last ounce of profit from every transaction, it will come as a shock to learn that in all the region around Shanghai, one of the granaries of China, only one installation for the utilization of rice straw is in operation, although two more are in process, one of promotion and the other of building. The following article tells of the equipment and layout of two of these mills, the more modern of which is that of the Ho Fone Strawboard Company, now under construction at Kashing.



Type of Bagley & Sewall Calender and Steam Drying Rolls to be Installed in the Kashing Strawboard Mill

As to the demand for strawboard, little need be said except that prices for this material are steadily rising due to an increasing demand for it as containers, even food products formerly packed in tins now come to market in the cheaper containers made of strawboard dipped in paraffine or some other similar material to make them air and moisture tight. The demand in China for all grades of cardboard is steadily increasing and importations now reach such a considerable sum that the promoters of the new mills have no fear of glutting the market for many years to come.

Ho Fone Strawboard Factory at Kashing

The latest development in one of China's "infant industries," that of turning waste rice straw that often has to be burned to get it off the landscape, into a valuable commodity such as strawboard, is the Ho Fone Strawboard Mill at Kashing which is now in process of erection by engineers of the American Trading Company's Shanghai branch. The mill is designed to turn out 20 tons of strawboard every day and every effort is to be made to manufacture high quality board for special purposes rather than the cheaper, rough board that is ordinarily found in the China market. The high quality board, it is anticipated, will replace quite a large volume of that at present being imported into the country.

The mill is advantageously situated with water transportation on two sides, one being a canal and the other a small river which flows into the Grand Canal near the site of the mill which is 540-ft. long by 210-ft. wide, affording ample space for the present plant and for a future extension to double its capacity. Storage space for coal and lime also is provided, while the straw, owing to the fire risk will be stored on the other side of the river across from the plant. The mill whose capacity was based on the actual amount of raw material easy to secure, will use only straw from the Kashing area, including the output from near-by towns and its.

The operation of making strawboard consists in cooking the finely chopped straw in milk of lime. For the present at least, the mill will depend upon near-by supplies of lime kilns situated near Kashing, but plans for burning its own lime, to secure better quality and at the same time cut down expenses, are being considered.

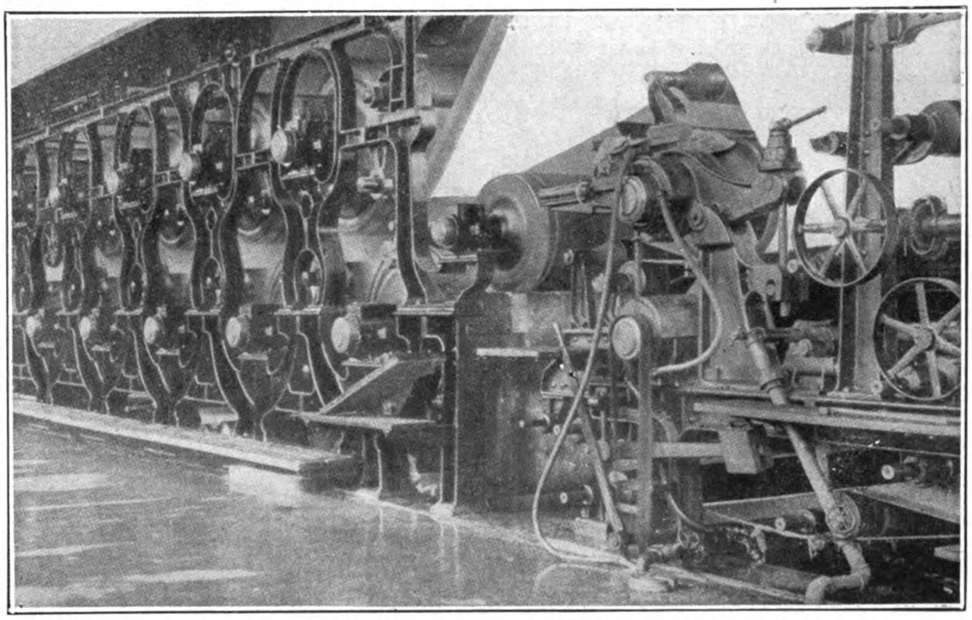
The straw cutting shed on the north side of the plant is equipped with comminutors of the Monarch type, supplied by the Silver Manufacturing Co., of Salem, Ohio. These have a capacity of 40 tons for each ten-hour day, the double capacity being installed to obviate the fire risk of cutting straw at night. From the cutters, the straw is blown by fans attached to the cutters up through a chute to the straw storage space on the upper floor from which it is charged by gravity into the rotary digesters. On this upper floor also are located the lime mixing tanks where the quick lime is dissolved and the lime liquor or lye is fed to the three rotary digestors which are of the McNeil type, fourteen feet in diameter, revolving about once in 3 minutes. Here the straw is cooked with live steam from the boilers for some four hours, effort being made by slow and thorough cooking to improve the quality of the resultant pulp.

The boiler plant consists of two 210 horse-power, cross drum water-tube boilers supplied by the Keeler Boiler Company of Williamsport, Pa., which are fed by two duplex feed water pumps 6 by 4 by 6-in. made by the Union Steam Pump Company of Battle Creek, Mich. The Swarthout feedwater heater by the Walworth International Company consists of two units. The boilers at the start will be hand fired, but Ajax shaking grates will be installed later.

After cooking in the boilers, the pulp goes to a specially constructed pit fitted with drum washers which form one of the main improvements in this mill over other similar installations elsewhere in the world. This unit takes out the larger percentage of foreign matter, dirt, sand, and all the other impurities that may have made their way into the digestors with the straw. The use of this washing pit lightens the load immensely on all the other preparation machinery that follow, since the latter operates on clean pulp and not a mixture of pulp and dirt. These washers, as well as the stuff chest of a special type, were designed by the

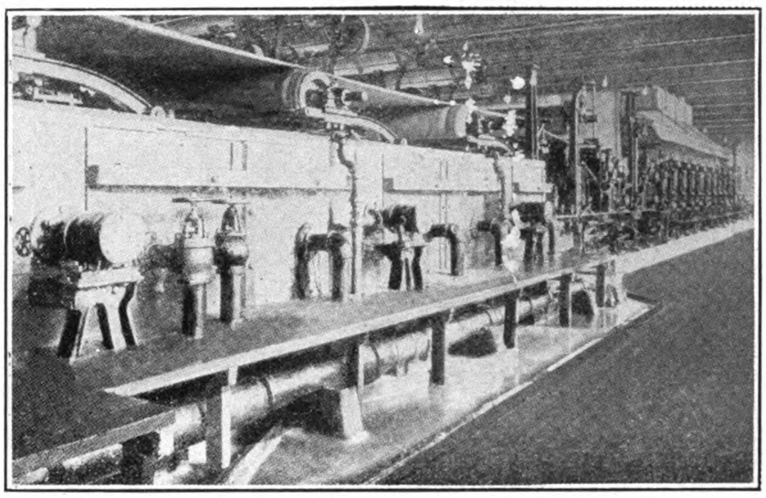
American Trading Company's engineers, amongst whom is a paper mill expert, to meet precisely the conditions that prevail in China. They also remove a good portion of the spent lye and deliver a purified product to the pumps.

The cooked and washed straw then goes to the six-inch Worthington Volute centrifugal pumps which elevate it to the beaters. These are of the hollander type as used in paper mills, being oval concrete tanks divided down the middle by a midfeather round which the straw pulp must circulate to

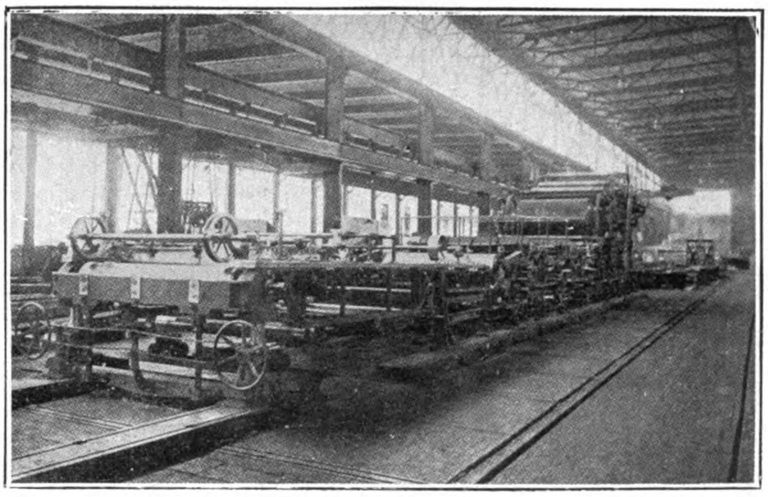


Portion of Second Press and Dryer Rolls which Convert Compacted Pulp into Coherant Sheet of Strawboard

what are known as the Jordan engines. These machines are cone shaped and are 4 feet 3¼ inches long with an interior revolving plug that ranges in diameter from two feet three inches at the larger end where the pulp is discharged, to 12½ inches at the smaller enp where the pulp enters. The Jordan plug revolves at 375 revolutions a minute and as it has 72 bars on the plug and 176 on the shell, these bars acting for all intents and purposes as knives, the pulp is evenly reduced to fibers in a very fine state of division. Only one Jordan is now being



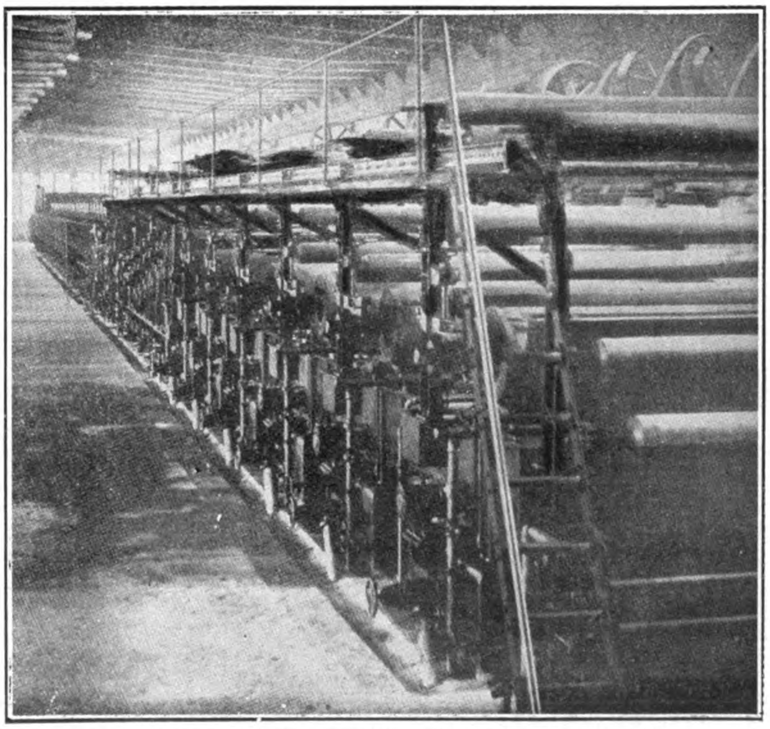
Wet End of 4-Cylinder Machine where Pulp is formed into Wet Sheet on the Cylinder Molds



Machine in Process of Erection for Test at N.Y., Watertown Works of Bagley & Sewall Co.

pass many times under the knives of the three beaters. These hollanders are made by the E. D. Jones Company of Pittsfield, Mass., and are two left and one right hand drive. The essential part of the beaters consist in 48-in. by 52-in. rollers each fitted with 62 blunt knives, technically known as "fly bars" which mash the boiled pulp across the stationary knives, one roll complete with fly bars weighing a little over three tons. Owing to the previous washing, the beaters have much easier work than in other mills where this feature is omitted as washing and beating is performed in one operation.

Each beater holds a charge of 1,200 pounds of pulp, freed from the last traces of foreign matter that may have clung to it. The straw pulp is discharged into a stuff chest and then pumped through stuff pumps made by Bagley & Sewall to



Six Cylinder Strawboard Mill Ready for its First Test Run

installed, but room has been left for a second when the plant is enlarged. This machine alone takes some 50 horse-power.

From the Jordan, the pulp is discharged to the board machine, the wet end of which is preceded by 2 ten plate flat screens of Bagley & Sewall make from which it travels to the mixing box thence into the vats in which rotate four cylinders 36-in. in diameter and 88-in. wide covered with wire cloth. On each one of these cylinders a web of wet pulp is formed which the bottom felt (of wool) picks up, and under the action of the couch roll, first one, then adds to this the others in turn until all four combine in one sheet, which then passes over the suction boxes and squeeze rolls to extract the moisture as far as possible. The 4-ply web is still carried by the bottom felt with the aid of another felt called the top felt, which send it through,

three sets of so-called "Baby" presses which have rolls 12-in. in diameter by 88-in. face. The top felt, relieved of its burden then returns to be cleaned of adhering bits of pulp. This cleaning process comprises whipping the blanket-like felt, washing it and restoring it to working conditions as regards face and texture.

The web, or embryo sheet of board, then goes to the first of the main presses which consist of top rolls of iron, 16-in. in diameter by 87-in. wide, and bottom rolls, rubber faced, which are of the same diameter as the iron ones, but only 86-in. wide. The web having come into contact with the bare polished surface of the iron roll then passes over the reversing device which insures that the side of the paper that was in contact with the iron roll of the first press now comes into contact with that of the second press. Then after passing through these main presses, the board gets its first heating since it left the cookers, and is passed over a receiving steam heated dryer which is 30-in. in diameter and 84-in. long. This dryer is steam heated.

Then the web, partly freed from moisture, passes into the most expensive item of the machine—a battery of 24 dryer rolls each 48 by 84-in., heated with steam led from the engines' exhausts. These are drying cylinders beautifully machined, not only are the faces ground, but the interior of the shell also is machined so that the thickness of the shell is absolutely even throughout. These rolls weigh 5,200 pounds each and are about one inch thick. The now practically dry strawboard sheet then passes to the reeling machine and from here to the calendar rolls which further compact the board and put upon it that final finish which adds so much to the appearance and market value of the finished product. These rolls are six in number the bottom one being 16-in. in diameter by 82-in. in width, then comes a 12-in., then three 10-in. ones with another 12-in. roll at the top. These calendar rolls are furnished by the Farrell Foundry & Machine Co., of Ansonia, Conn., and weigh eight tons without the frame in which they are housed. The strawboard, which started through the process as a comparatively thin, fragile web, now is a firm and compact sheet of board which is ready for cutting to size and making ready for shipment. The cutter which it next passes, has five pairs of "slitters" which trim off the rough edges and divide the sheet in widths of 25-in. while a revolving knife cuts these to the required sizes, ordinarily, in China, 25 by 30-in. The trimmings are then sent back into the pulping units for working over into pulp again while the finished sheets are inspected, counted and made up in bundles of 50-lb. before going to the batten press which packs them in bales, four bales forming one ton. The board at present planned will range up to 20 gauge or some 0,056 inches in thickness.

Board thicker than this must be made by pasting two or more sheets together with silicate of soda and it is the ultimate aim of the factory to make whatever thickness of sheets the trade demands, although at the start only the thinner sheets of the highest possible quality will be the goal. Plenty of room is available for the installation of this and other machines which the company has in mind.

As to the powerplant, the board machine's constant speed parts are driven from the main shaft, about 80 horse-power being used for the four stock pumps, two screens and other pumps. The variable speed part of the mill which requires about 100 horse-power, is driven by a Brownell (Dayton, Ohio) twin-cylinder engine with special governor which permits changes in speed in the ratio of one to six. Speed varying devices are used to drive the dryers, presses, calenders, reels and cutters at their proper pace. The main powerplant has one 340 b.h.p. Allis Chalmers simple Corliss engine of the drop valve type, with a 10-foot flywheel. The crankshaft of this is connected through flexible coupling directly to the main line of shafting which drives the beaters and other extra heavy machinery, thus dispensing with much belting losses that would normally occur. A special pulley attached to the engine crankshaft also drives the shaft carrying power to the constant speed part of the board machine.

The reinforced concrete stack that serves the boilers is planned to meet probable future requirements and is 130-ft. high by 6-ft. in diameter. It was built from designs by the Truscon company which supplied the material in large part. The stack sets on a foundation 26-ft. square. One of the prime requisites for a strawboard mill is an ample supply of water instantly available in every part of the mill and is insured by a reinforced concrete tank elevated 60-ft. from the ground. It is 20-ft. in diameter at the base and the tank proper is 14-ft. in diameter by 10-ft. deep. The water supply is pumped through a line of 12-in. concrete pipe from the river and is elevated to the tank by a 6-in. Worthington pump whence it is distributed under 60-ft. head throughout the plant.

The works will have its own lighting plant which has been purchased from the Ridgway Dynamo & Engine Company of Ridgway, Pa. This not only lights the plant but furnishes power for the machine shops and packing press. The set is a 25 kilowatt one furnishing current at 125 volts direct current. The company has provided against breakage or wearing down of small parts by installing a pattern shop, foundry and machine shop so that any ordinary repairs and renewals can be taken in hand without expensive waits for parts to come from Shanghai or America.

Wah Chang Strawboard Mill at Soochow

The only strawboard mill now operating in central China is that of a Chinese company at Soochow whose success has led to the formation of the Wah Chang Strawboard Company which proposes to put in a 20-ton mill in the Japanese concession where a site already has been purchased and contracts for machinery are being considered. The mill now in operation is located more than a mile outside the city wall and is on the banks of the Soochow creek from which it draws its water supply. The site is 20 *mow* or slightly over three acres on much of which the straw is stored in the open in huge piles. The buildings are of brick and concrete with tile roofs in the main although part of the roofs are of wood.

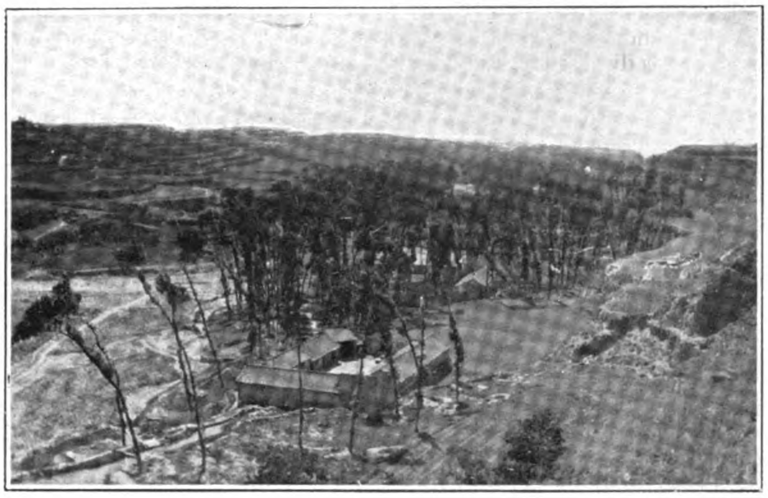
With its present equipment, the mill consumes approximately 18 tons of straw a day from which some 12 tons of strawboard is produced each 24 hours, but by crowding the equipment somewhat, it is asserted that 14 tons a day can be made. A new cooker of fifteen feet diameter is to be installed to raise the output of the plant to approximately 20 tons. The mill has a 200 horse-power engine of American manufacture and two boilers of the Scotch marine type which were purchased in Shanghai. The paper machine and most of the other equipment is of Japanese manufacture.

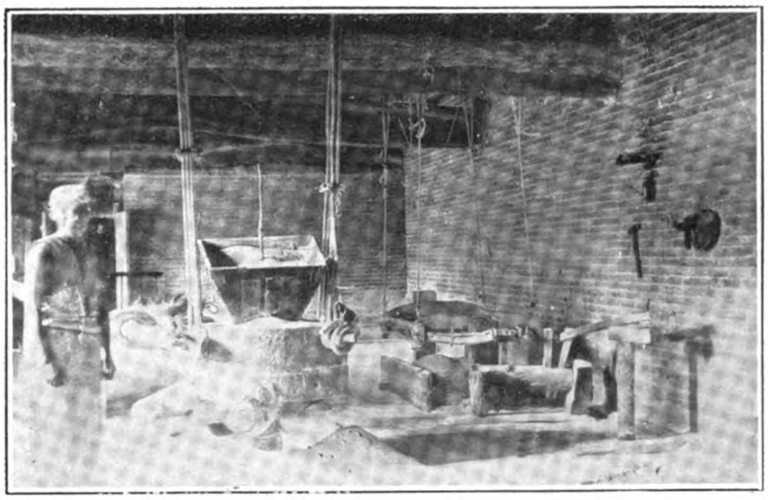
The mill has two straw cutters which reduce the material to three inches lengths and discharge into a small pit from which the straw is elevated by a home-made lift consisting of a belt with wooden strips bolted on. This takes the straw to the floor above the cookers which are 13-ft. in diameter and of the Globe rotary type. The cookers are mounted on masonry foundations seven feet above the floor level and discharge into a concrete sump in which is an inclined cylindrical screen where a preliminary washing is given the cooked pulp which is then elevated by a device consisting of metal strips mounted on two chains to the three beaters ten feet above the main floor level. The beater tubs are 14-ft. long by eight feet wide and three and one-half feet deep. Each has one beating cylinder equipped with knives and two washing cylinders. The beaters discharge into wooden chutes which lead directly to the two stock chests where the pulp is agitated by power-driven stirrers. These stock chests are of concrete, ten feet in diameter by nine feet high having on the outside of each single vertical stock pumps, power driven, which pump the stock to two small Jordan engines from which the stock is discharged into concrete stock chests similar to those above each with its own agitator and pump which sends the stock up some 15-ft. to a distributing box from which it is fed to the vibrating screens at the wet end of the paper machine.

These vibrating screens discharge into the cylinder chest where the pulp is picked up on four revolving cylinders by means of a traveling felt which passes through rolls that squeeze out as much of the water as practicable after which the pulp passes to the drying rolls, 26 in number, about 36-in. in diameter with width sufficient to produce a sheet 72-in. wide. These rolls are served by a traveling canvas to support the film of paper through the lower tier of rolls. The dried cardboard then goes to the six-roll calendar and thence to the slitting and cutting machine which turns out sheets about 20 by 36-in. and trims the edges of the sheets. The sheets are tested as to weight on a small hand scale from time to time and then pass to the packers.

The main power plant consists of two boilers of the Scotch marine type approximately 30-ft. long by 13-ft. in diameter, made in Shanghai. One 200 horse-power cross compound Corliss engine, said to be of American manufacture, was used for driving the main

(Continued on page 511.)





TYPES OF NATIVE CHINESE FLOUR MILLS

Chinese Water Power Flour Mill.—Exterior View.—Located in the Yu Tao Ho Valley, near Fenchowfu, three days ride by cart, beyond Taiyuanfu, Shansi Province

Chinese Water Power Flour Mill.—Interior View showing the primitive stone mill and sifting apparatus described in the accompanying article

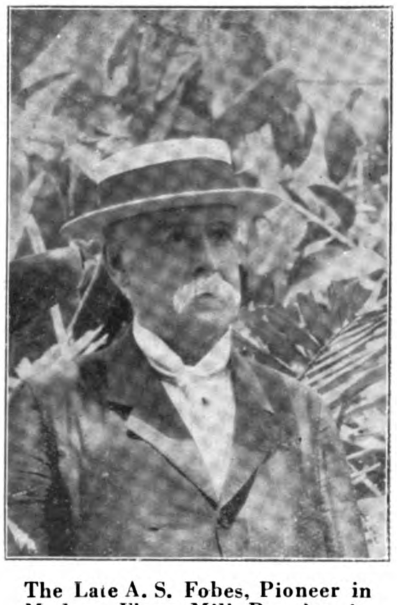
Wheat Flour Mills of China

By G. D. Woodyard

Note.—The following account of flour mills and flour milling in China, written by Mr. G. D. Woodyard, engineer for Fobes Company, Limited, is remarkable for the sharp contrasts it draws between the ancient Chinese methods, substantially those used in Ninevah when the Tower of Babel was being built, and the enormous advance in milling practice that has come about since the first modern American flour mill was placed in operation.

THE foreign community of China and especially the American colony will recall the genial, lovable personality of Mr. A. S. Fobes who died a few years ago after a plucky uphill fight to retrieve a fortune that had been shattered through no fault of his own after he had retired to enjoy a well earned rest from fifty years of business activities in China. How cheerfully he faced his misfortunes and " came back " in the business world, stands as an example of sheer pluck that many younger men may envy. Mr. Fobes was one of the earliest pioneers of the American colony of Shanghai, arriving here in 1863 on the old clipper ship " St. Paul," after a voyage of 165 days from New York. In the following year he opened the " Heng-fung " hong next door to the old American consulate in Whangpoo Road. Some time during the early nineties the first roller process flour mills were brought to China by Fobes & Co. Mr. Fobes was quick to see the wonderful possibilities in the development of the wheat flour industry and determined to specialize in this particular line of engineering, a policy which has enabled his firm to arrive at the enviable position of having erected more flour mills units in this country than all other competitors combined. The experience of Fobes & Company in this particular industry is an added argument which strengthens the growing sentiment that only by specialization in engineering matters can lasting success be obtained in this vast and complicated market.

In the year 1918, an agreement was made whereby this firm became the exclusive agents for China and Manchuria of Nordyke & Marmon Company, of Indianapolis, Ind., one of America's leading flour mill builders ; since when the firm has installed 33 complete flour mill units of all sizes and capacities of that company's manufacture. These mills have been erected in various towns in the length and breadth of China, from Shanghai to the north as far as Tsi-tsi-har in north Manchuria, in the heart of the " Hung Hutze " (Red Beard) bandit country, and west as far as Tai-yuan-fu, in Shansi province. The illustrations to this article will serve to give an idea of the exterior and interior views of some of these mills.

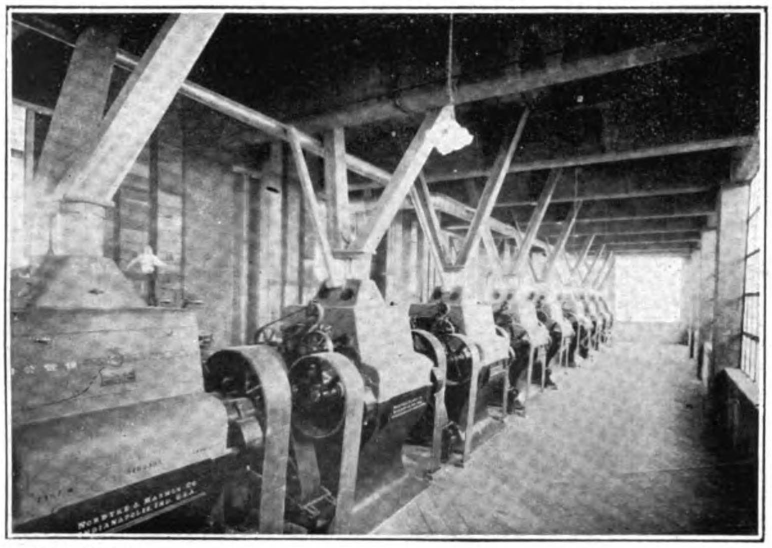


The Late A. S. Fobes, Pioneer in Modern Flour Mill Practice in China

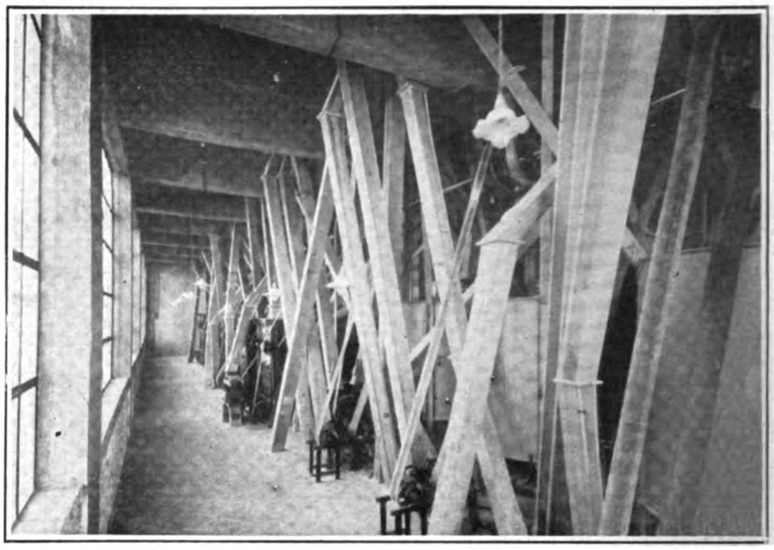
Ancient Milling Methods

Although the Chinese are among the oldest people in the world to be familiar with the use of flour ground from wheat and corn, until approximately 25 years ago only the most primitive mills were used in this country. The illustrations will give an idea of the several methods used in this crude native system. Probably one of the most ancient is the " mortar and pestle " sort of arrangement, where the grain is poured into a groove or hollowed out place in the lower rock, and the circular grinding rock moved back and forth by means of a handle, fastened by a pivot-like arrangement shown in the foreground. Before grinding, the grain is roughly cleaned by use of a hand sieve or by winnowing, to remove the chaff, straw, bitter tasting cockle seed, wild peas, stones, sand and other foreign materials detrimental to the taste and color of the flour. In the interior, nearly every village possesses one or more stone mills of one of the types illustrated, by means of which they have ground their flour as needed, for generations.

The Chinese flour mill driven by water power, located in the Yü Tao Ho valley, three days ride by cart beyond Tai-yuan-fu, Shensi province, shows what was probably the highest type of Chinese flour mill in use before the coming of the modern American roller mill. This mill represents a marvel of primitive ingenuity, being constructed entirely of stone, wood and

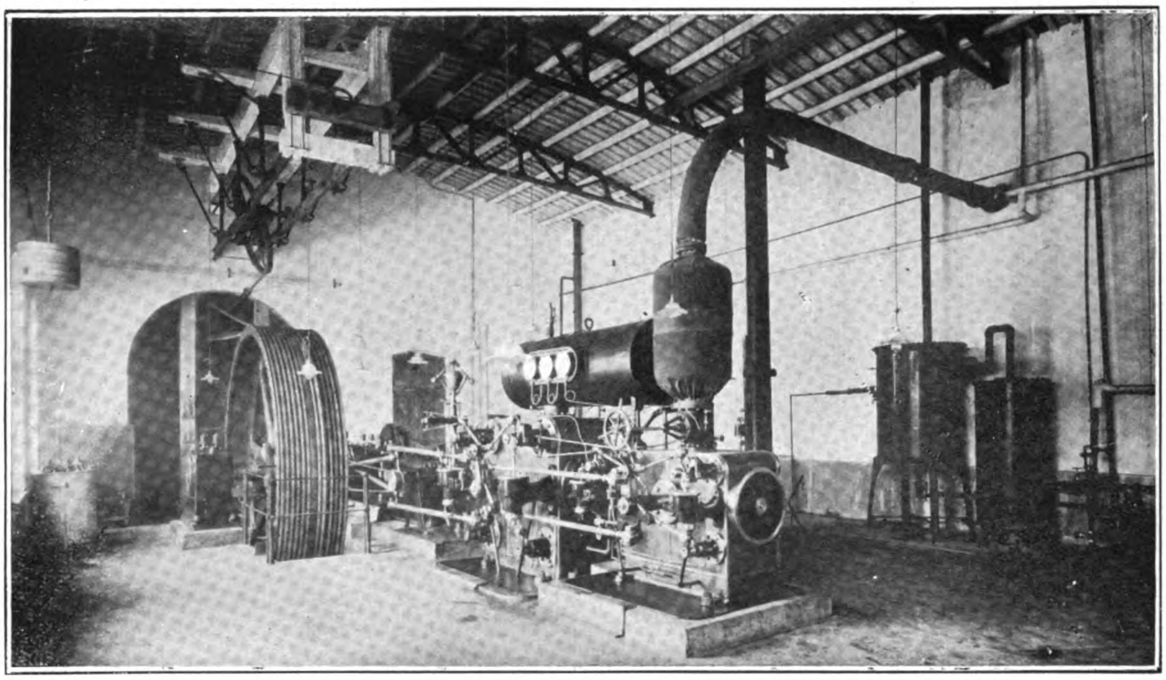


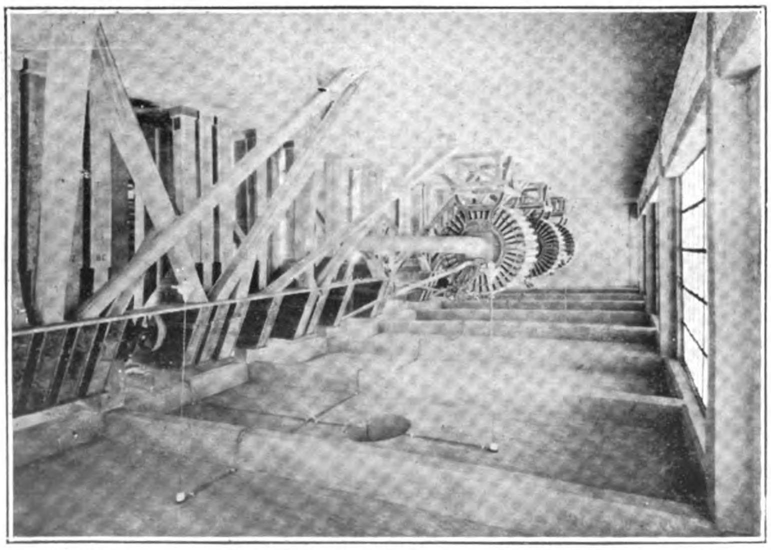
2nd Floor



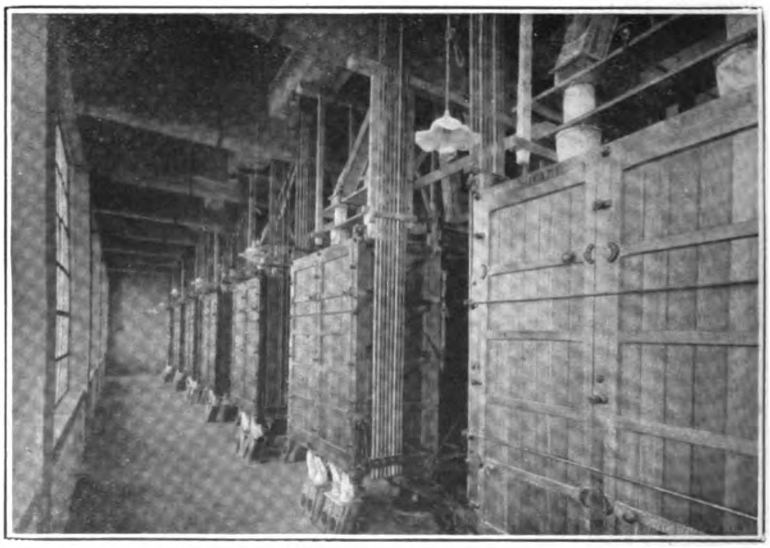
3rd Floor

ropes, without a nail, screw or bolt in the whole outfit. The grinding stones approximately 4 feet in diameter were hewn from a native quarry nearby. The upper stone is stationary kept from turning by the large wooden post at the left. The grain is admitted through a circular opening in the centre of this stone. The square hopper shown sits above this opening. The miller controls the grinding, fine or coarse, by lowering or raising the wooden binding pieces on the ropes by which the upper stone is hung from the ceiling rafters. The lower grinding stone revolves. It is mounted on the two cross beams shown, which in turn are fixed on a vertical wooden shaft con-





5th Floor



6th Floor

Interior Views of the New Fu Hsing Floor Mill at Tientsin. An Exterior View of this Mill is shown on Page 505

2nd Floor: Showing one of the two files of the latest Double Roller Mills on the Grinding Floor, equipped with all metal housing, stream splitters, glass sight tubes and a new type of self-aligning sleeve bearings. **3rd Floor:** Showing Bran Dusters, Purifiers and Spouting. **5th Floor:** Showing "Square Sifters." **6th Floor:** Elevator Discharges and Dust Collectors. **Centre:** Power Room equipped with 600 h.p. Tandem Corliss engine manufactured by the Murray Iron Works, Burlington, Iowa. Fobes & Company have installed more than twenty similar complete steam power plants in various parts of China. Although the mill building adjoining this power plant was completely destroyed by fire in 1922, due to a double fire wall and a fireproof roof, this power plant escaped damage and is now driving the new mill.

nected below by means of crude wooden gears (or spokes) to the water wheel. The upright post or vertical shaft at the right is similarly connected to the water wheel, and by means of the crude arrangement shown in the foreground, to the right, shakes the sifting sieve back and

Hand Power—Village Stone Mill

Primitive "Mortar and Pestle" Mill

Village Stone Mill turned by Donkey

forth. The arrangement for keeping the meshes of the cloth from clogging is simplicity itself. The sieve is hung so that it knocks against the square post at the rear at every swing. The bolting cloth, unlike the wonderful and expensive silk bolting cloth used in modern mills, is made of horsehair. The Chinese are very clever in the making of this horsehair bolting cloth and obtain a uniformity in the mesh that is really remarkable.

The ground product from the stones falls to the floor, and as soon as enough has accumulated, is scooped up and dumped into the sifter at the right. The sifted and finished product again falls to the floor and either lies there until needed, or, if during the busy season, with plenty of grain to grind and water available to move the water wheel, the flour is scooped up and placed in tall earthernware jars or in bags.

The flour produced in such primitive installations may not be as white as that manufactured in up-to-date roller mills—it is coarser and necessarily darker in color and too often will contain small bits of the grinding stones, as well as fine ground rock and other impurities usually not removed by the crude cleaning methods used—but it is edible. While it is possible, by using fine enough meshed bolting cloth, to obtain a flour by this simple process that is equal in fineness to that sold in the city markets, it would not be as white and would be full of specks. As a rule, the product made by these old-fashioned stone mills is called "whole wheat" or "Graham flour." This type of flour was more popular with our grandfathers than with the present generation, although every once in a while nearly everyone gets a hankering for "Graham muffins."

However, whole wheat flour can be made just as well, if not better, in the modern roller mill and under perfect hygienic conditions. While in China there are literally thousands of these stone mills, in their many forms still in operation, and their use here will probably be prolonged for many years yet, due to China's cheap labor, nevertheless, with the coming of the modern roller mill, with its clean, scientific and efficient system, these primitive, though picturesque, mills will be obliged to go out of business.

Modern Practice

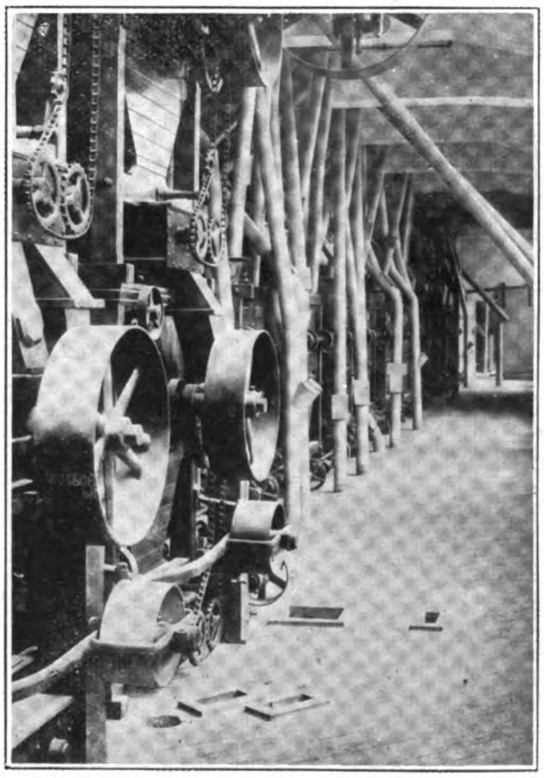
In contrast to the above methods are the many fine new mills equipped with the modern American roller process of flour mill machinery. Thirty-three of these modern mills are operated by machinery manufactured by Nordyke & Marmon Company, of Indianapolis, Indiana, U. S. A., and installed by Fobes Company, Limited, are now at work in many of the principal towns and ports of China and Manchuria.

FOH SING FLOOR MILL—MILL No. 8, Mokanshan Road, Shanghai

Capacity 14,000—50-lb. bags of wheat flour per day. Equipped with Nordyke & Marmon Co. milling machinery. Six stories in height, built entirely of reinforced concrete, of daylight construction, with all-metal elevators, spouting and wind trunking inside, together with a modern sprinkling system which is connected to the water tank concealed in the tower, this mill represents the last word in modern fire-proof flour mill construction. This mill is one of the largest as well as the finest in the Shanghai district. The interior views of this mill are on page 504

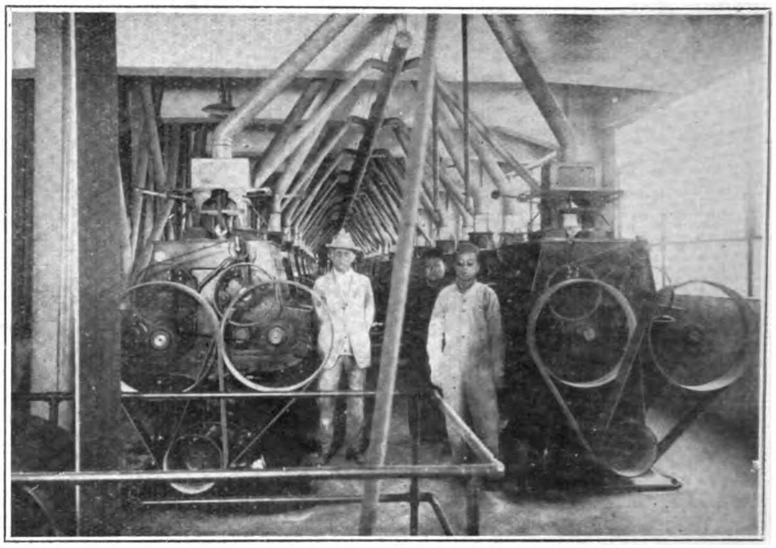
Foh Sing No. 8 Mill, Shanghai

Of the mills in South China, probably none represents a finer type than the Foh Sing No. 8, Mokanshan Road, Shanghai. Six storeys in height, built en-

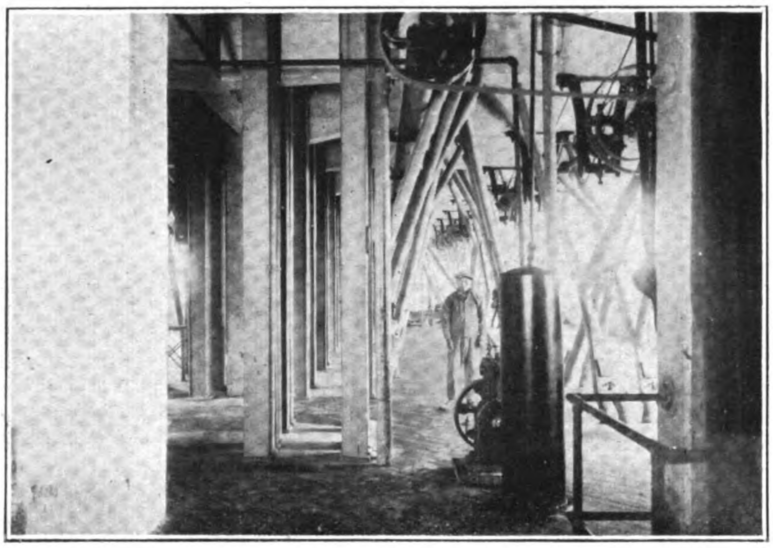


4th Floor of the Foh Sing No. 8 Flour Mill, Showing Purifiers and Reels, Views of the other Floors appear on opposite Page

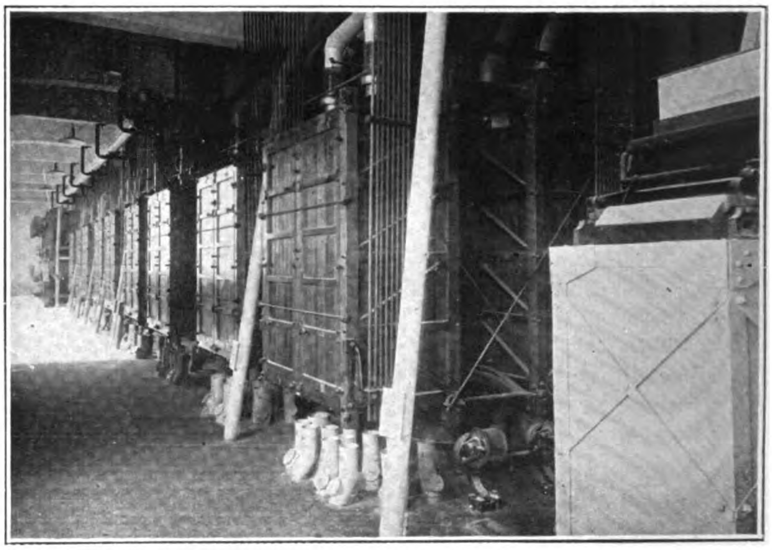
1ts Floor: Automatic Packing Machines



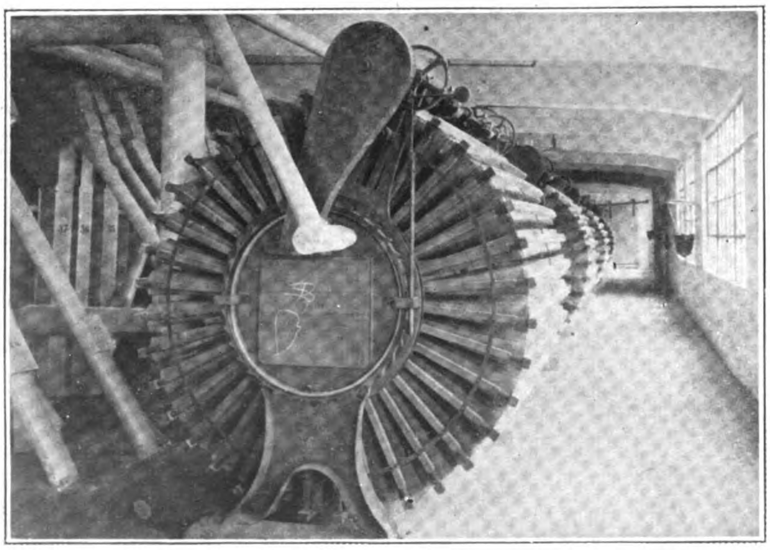
2nd Floor: Showing 28 Double Roller Mills on the Grinding Floor



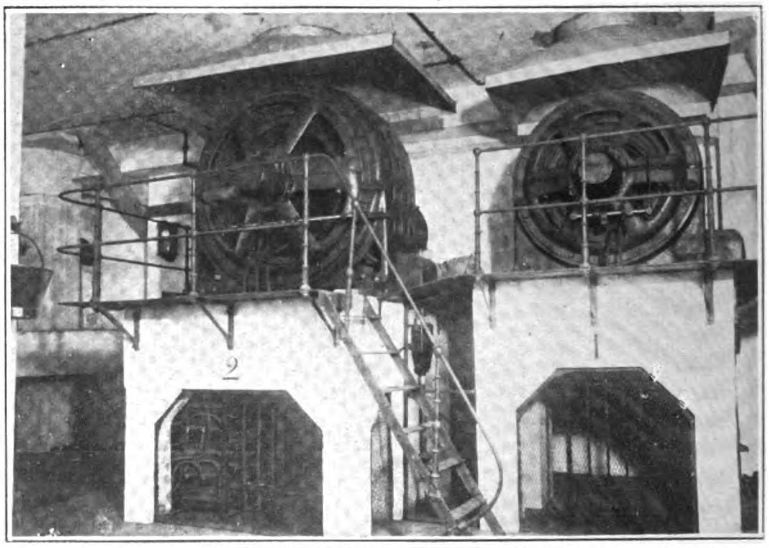
3rd Floor: Spouting Floor



5th Floor: Sifting Machines and Reels



6th Floor: Showing Elevator Discharges and Dust Collectors



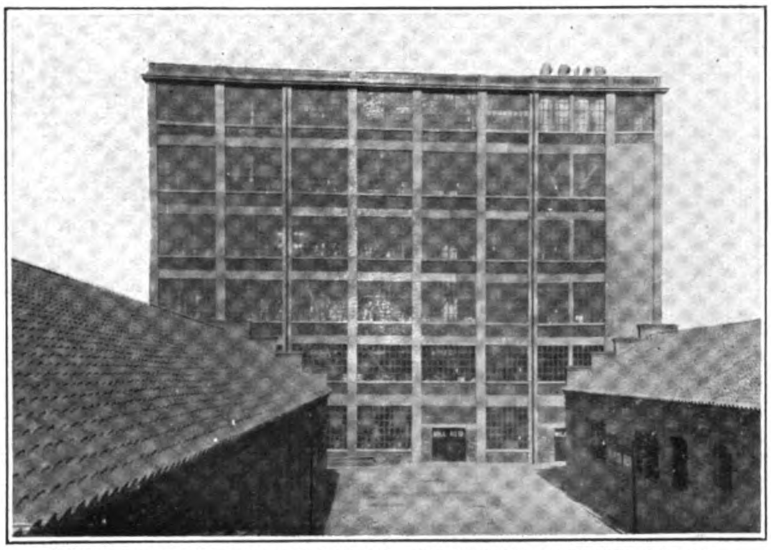
Motor Room: Showing 1—500 h.p. and 1—250 h.p. General Electric Motors direct connected to main line shafting. The larger motor drives the milling machinery, the smaller the cleaning machinery

Interior Views of "B" unit of the Foh Sing No. 8 Mill, Shanghai
There are two units "A" and "B"

tirely of reinforced concrete, of daylight construction, with all metal elevators, spouting and wind trunking inside, together with a modern sprinkling system which is connected to the water tank concealed in the tower, this mill represents the last word in modern fire-proof flour mill construction. This mill, one of the largest in the Shanghai district, is comprised of two independent units, both under the same roof, with a total output of 14,000—50-lb. bags of wheat flour per day. It is electrically driven, having one direct connected, 500 h.p. General Electric motor and one 250 h.p. motor for each unit of 7,000 bags.

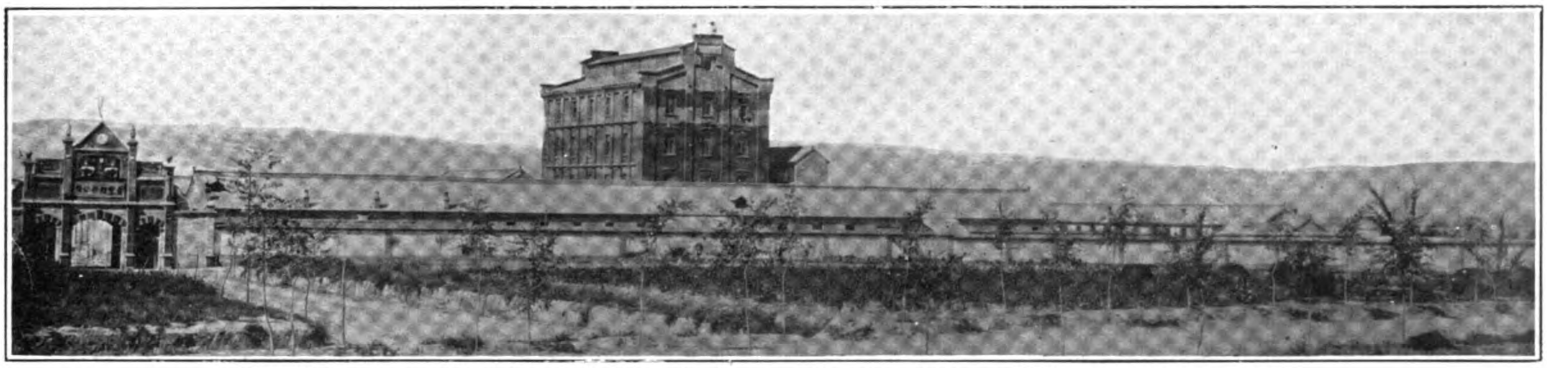
The wheat cleaning department is separated from the milling department by a reinforced concrete fire wall and well, extending the full height of the building, with fire-proof doors connecting, so that in case a fire should occur on any floor, it could be quickly isolated and put out. A modern service elevator, located in the well, gives the miller and his operatives quick access to any floor.

This mill is located on the Soochow creek and there are extensive godowns to take care of both wheat and flour, which are stored separately. Practically all of the wheat is delivered to the godowns by sampans or lighters and most deliveries of flour to Shanghai are by boat. This mill, as well as the 5,800 bag mill, "Mow Sing No. 2," at Wusih, is owned by the large flour mill combine managed by Mr. T. K. Yung. This company owns and operates 14 flour mills in this and the central part of North China.

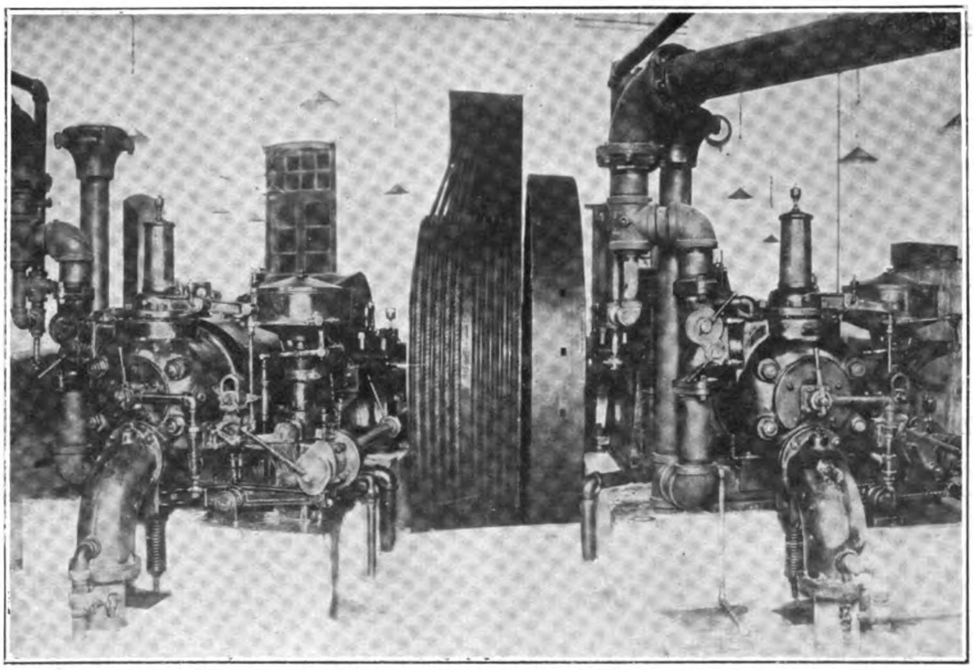


NEW FU HSING FLOUR MILL—TIENTSIN, NORTH CHINA

Capacity, 5,800—50-lb. bags of wheat per day. This fine new mill equipped with the latest American machinery was placed in operation in March of the present year and in it are embodied various modern improvements that are to be found in no other mill in China. Without a doubt this mill and its products can compare favorably with the best in any country. Interior views of this mill are shown on Page 502



The Ching Foong Flour Mill at Taiyuanfu, Shansi. Capacity, 1,500—50-lb. bags per 24 hour day



300 H.P. Twin Cylinder Otto Producer Gas Engine

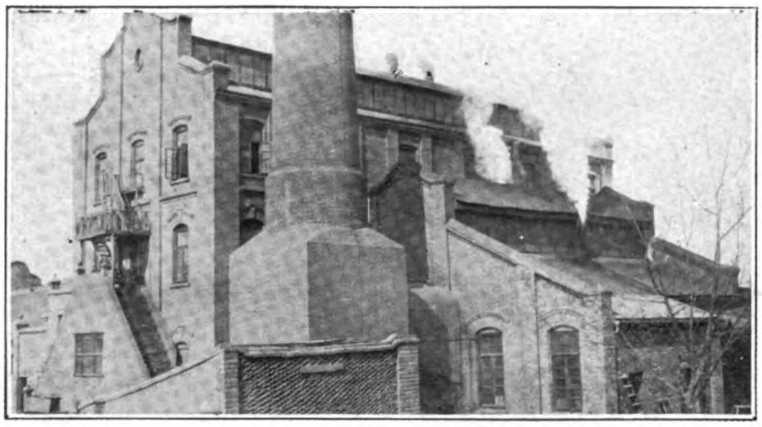
CHING FOONG FLOUR MILL Taiyuanfu, Shansi Province

The above plant was manufactured by the Otto Engine Works of Philadelphia, Penn., and is among the first gas producer plants to be installed as a power plant of a flour mill in China. Although the initial cost of this type of plant is usually a little higher than that of a steam power plant, the fuel consumption is considerably less, and provided a plentiful supply of anthracite coal is available, a gas producer plant is to be preferred. The power plant of the above mill is comprised of the following equipment: 1—300 H.P. Twin Cylinder Producer Gas Engine; 1—No. 8 Gas Producer and Scrubber; 1—Gas Receiver; 1—No. 3 Auxiliary Engine and Accessories and 1—Curtis Compressor.

The total output capacity of all of them is said to be in the neighborhood of 80,000—50-lb. bags per 24 hours. From the time this mill was constructed until a few months ago, this No. 8 mill was under the able supervision of an American mill expert, Mr. James Sanborn, but since his resignation it has been run by a native operator.

New Fu Hsing Mill, Tientsin

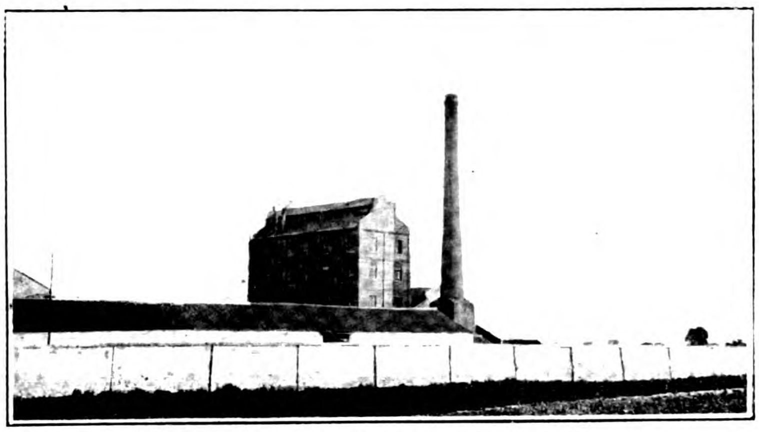
The first Fu Hsing Flour Mill, at Tientsin, North China, was built in 1919, and was equipped with Nordyke & Marmon Company machinery. It was located on the Yu Ho Canal, one of the branches of the Grand Canal. In fact, whenever possible, the Chinese always try to obtain a site located on a canal, to take full advantage of the cheap waterway transportation. The capacity of this first Fu Hsing Mill was 4,700 bags per day. It was successful from the outset, but in the winter of 1922 a disastrous fire completely gutted the mill building. Only the bare walls were left standing. The mill company was protected to a large extent by insurance. As it had had wonderful success new capital was quickly forthcoming for a new mill which was planned on a much larger scale to take care of the company's ever increasing business. The directors were so highly pleased with the results obtained from the Nordyke & Marmon equipment supplied for the first mill, that they chose the same class of machinery for the new mill, without a dissenting vote, but in this case Mr. Chang, the progressive and capable general manager of this company, gave Fobes



Tien Feng Flour Mill, Kaifengfu, Honan Province.
Capacity, 3.000—50-lb. bags per day

Company *carte blanche* to build the best mill possible.

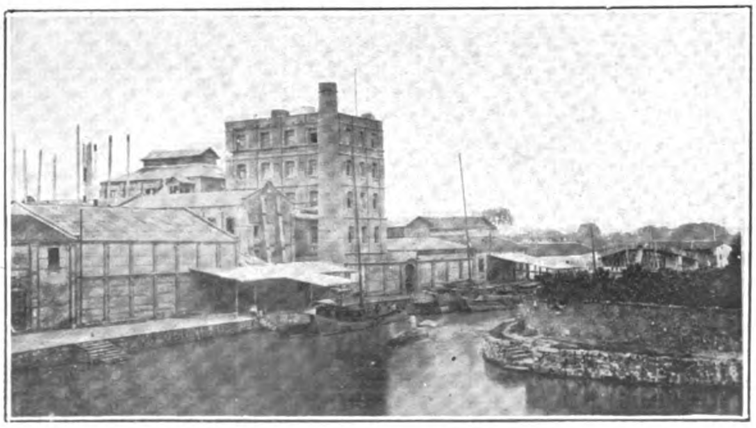
Although the fire had completely destroyed the milling machinery of the old mill, it had been possible to save the 600 h.p. modern steam power plant, with its Murray Iron Works Tandem Corliss engine, and this excellent plant, after a few minor repairs, and the addition of McMillan automatic fuel saving furnaces, was used to drive the new mill which was erected on the old mill site. The mill building and godowns are in a compound surrounded by a high wall, but the illustrations will give a fair idea of its appearance. The six storey building is of reinforced concrete, daylight



Hung Foong Flour Mill, Changchow, Kiangsu Province.
Capacity, 3,000—50-lb. bags per day

construction and is as near fire-proof as it is possible to make a flour mill building. A fire wall separates the milling department from the wheat cleaning department. The double roller mills are equipped with the latest type self-aligning sleeve bearings and all metal fire-proof housing, with glass tubes and stream splitters above. A very perfect dust collecting system insures an almost dustless mill throughout.

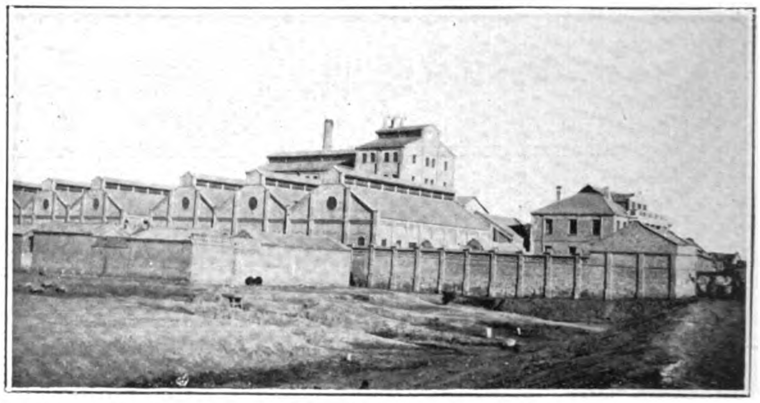
This mill was the first one in China to put in the Alsop electrical bleaching and ageing process with the new " Perfected Arc Elec-



Mow Sing Flour Mill—Mill No. 1, Wusih, Kiangsu Province.
Capacity, 5,800—50-lb. bags per day

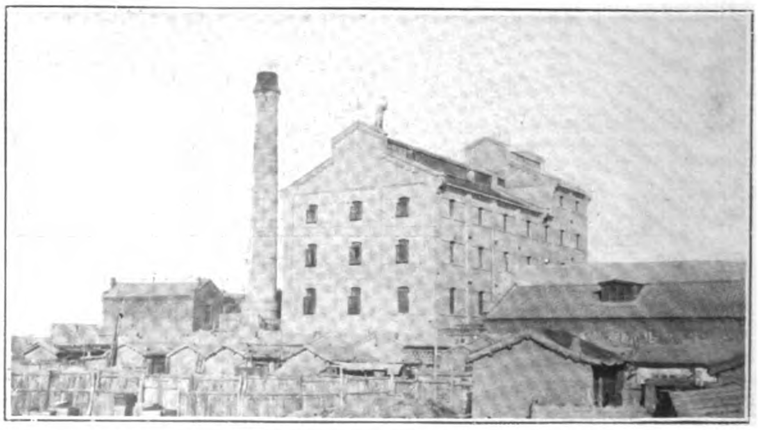
Ching Feng Flour Mill, Tientsin, Chihli Province
Capacity, 3,600—50-lb. bags per day

trifier," which equipment has proved an unqualified success. Practically all flour manufactured in China has been unbleached, whereas nearly all of the flour imported from American mills is bleached. This mill was also one of the first to put in modern machinery for closing the filled flour bags by machine, as is the practice in most modern mills at home, instead of the old laborious and costly method of hand sewing, still in use in practically all Shanghai mills. By the installation of these two machines and a conveyor on the packing floor, the hire of 23 coolies on that floor was saved. On the packing floor in the old mill, the coolies had

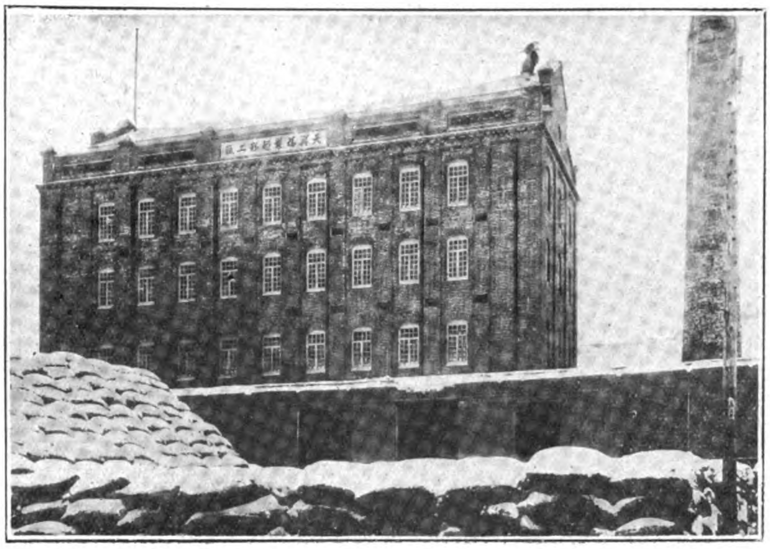


Ta Feng Flour Mill. Tientsin, Chihli Province.
Capacity, 6,200—50 lb. bags per day

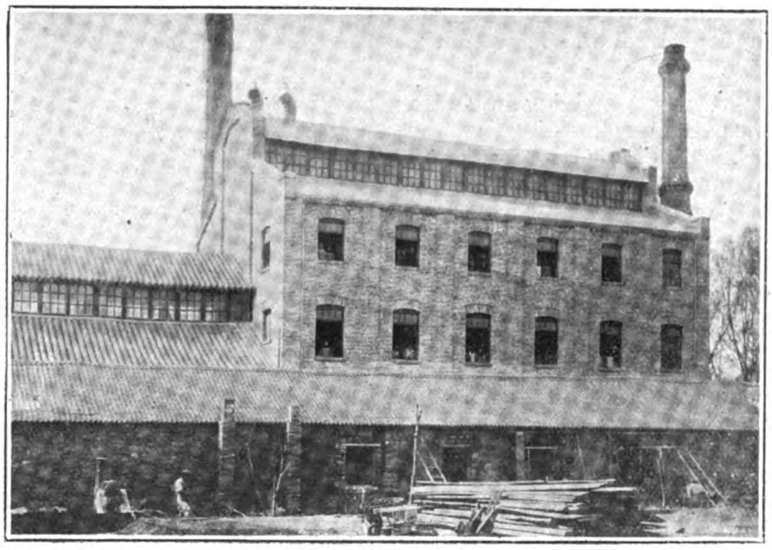
been so numerous that they could hardly keep out of each other's way. The " Union Special " sewing machines which close these filled bags of flour are not only swift in operation, each machine being able to handle up to 200-50-lb. bags an hour, but the bags are closed with a double locked stitch that makes it extremely difficult for anyone to tamper with the contents. To illustrate the importance of this point, a bag of flour may pass through half a dozen middlemen before it reaches the ultimate consumer. If *hand* sewn, the contents of the bag may be tampered with in many



Old Fu Hsing Flour Mill (burned down December 1922), Tientsin, Chihli Province. Capacity, 4,700—50-lb. bags per day



Tien Hsing Foh Flour Mill—Mill No. 1, Changchun, Kirin. Capacity, 3,000—50-lb. bags per day



Foong Nien Flour Mill, Tsinanfu, Shantung Province. Capacity, 5,000—50-lb. bags per day

ways, such as, taking out a few pounds, emptying a No. 1 quality flour bag and substituting No. 2 quality flour and then selling this cheaper, darker flour for the price of the better quality, a practise always detrimental to the good name of the mill's products.

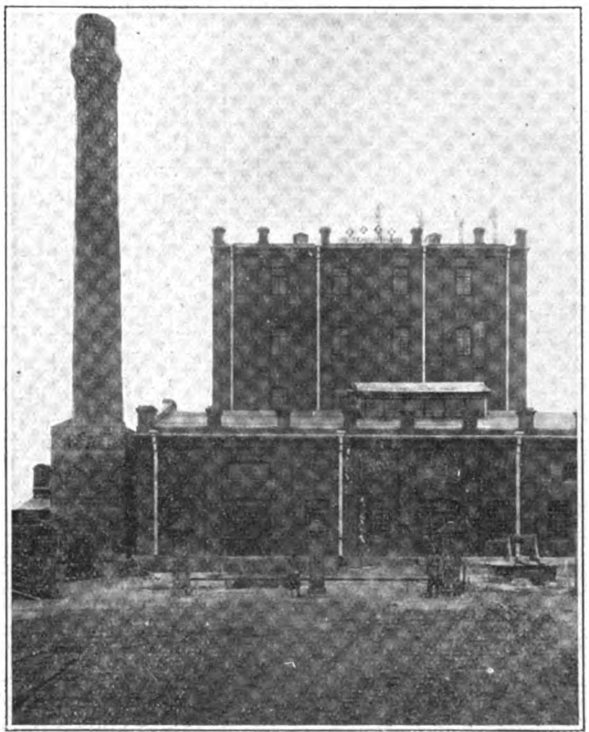
Mr. Chang is one of the few managers in China to recognize the importance of not only keeping his fine new plant up to maximum efficiency, but of turning out a first-class flour of uniform strength and quality. To ensure this he placed his mill from the time the machinery was ordered under the able supervision of one of Fobes Company's flour mill engineers, Mr. Wallace Larson. Since the mill started operation in March of this year, it has turned out a flour that for whiteness, purity and strength is difficult to equal in all North China. From almost the first day Fu Hsing brand flour has been sold on the Tientsin market for 5 to 15 cents more a bag than any other flour. Based on a daily output of 5,800 bags, at only 10 cents extra per bag, efficient supervision would seem to be well worth while.

Handling of Wheat in China

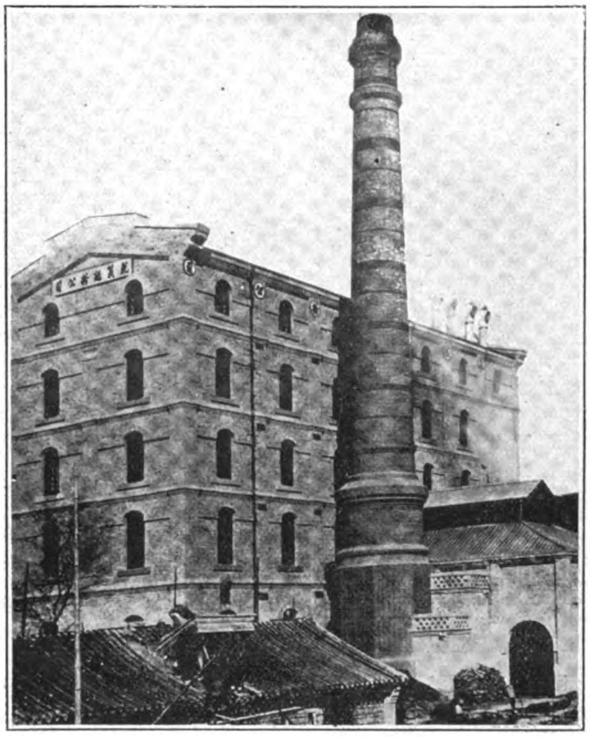
To those not familiar with the manufacture of flour, a brief explanation of the system employed in one of these modern mills of China might be of interest, also the methods of getting the wheat to the mill. Although the machinery and general equipment inside the mill building proper is as modern as any in the world, the methods of handling the wheat in China from the time it is cut until the time it goes into the first cleaning machine of the mill's system, are very different.

In America, for instance, no up-to-date flour mill would be built without a grain elevator adjacent for adequate wheat storage, and equipped with complete machinery for elevating, conveying and cleaning the wheat by mechanical means. In rural communities, if the wheat comes to the mill's elevator by farm wagon or motor truck, it is driven upon a platform scale, the whole load of several tons is weighed in an instant, the bags are emptied into a hopper by the driver. The empty conveyance is again weighed and the owner given credit for the net weight of wheat. After the wheat is dumped from the wagon bed into the hopper (if from a railroad car the process is the same) it is conveyed and elevated to the mill's large storage silos entirely by machinery, and *one man* will check in hundreds of tons of wheat in a day. From the time the bags are dumped into the hopper the wheat is handled entirely by machinery, until it is turned out as flour and its by-products. Quick, efficient and economical methods had to be developed in America where wages are high.

In China for the most part, the ancient methods of harvesting the grain by hand, threshing with flails, mules, and big stone rollers on a threshing floor, the winnowing of the grain by throwing it up into the air and letting the wind blow the chaff away, are practically the same to-day as a thousand years ago! The grain is delivered to the mill, if by land, in Chinese wheelbarrows, two wheeled carts drawn by oxen, buffalos, donkeys, horses or mules, and sometimes even on wooden sledges. If there is a canal available, delivery to the mill is by sampan or junk. If the junk or sampan is watertight the wheat may be handled in bulk and on the arrival at the mill it is passed up in baskets from hand to hand to the loading wharf where it is put in bags furnished by the mill company. More



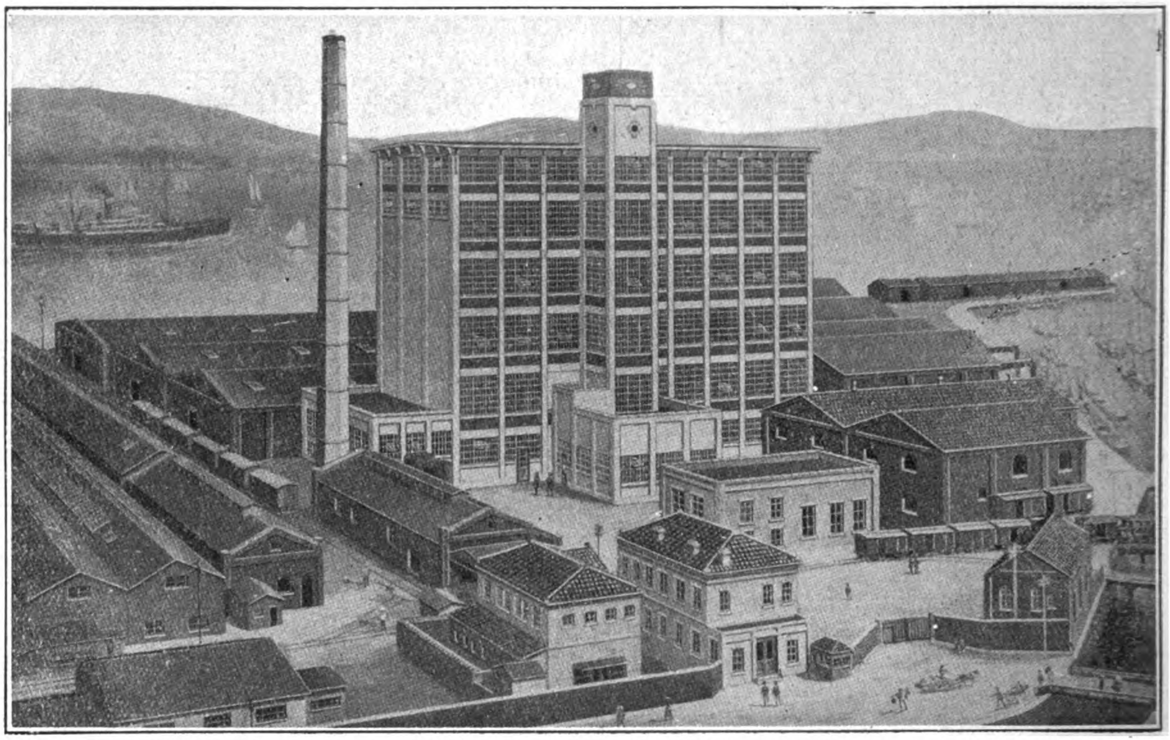
Chen Chong Flour Mill, Tsi-tsi-har, Manchuria, Capacity, 1,000—50-lb. bags per day



Chen Nee Kung Flour Mill, Paotingfu, Chihli Province. Capacity, 3,400—50-lb. bags per day

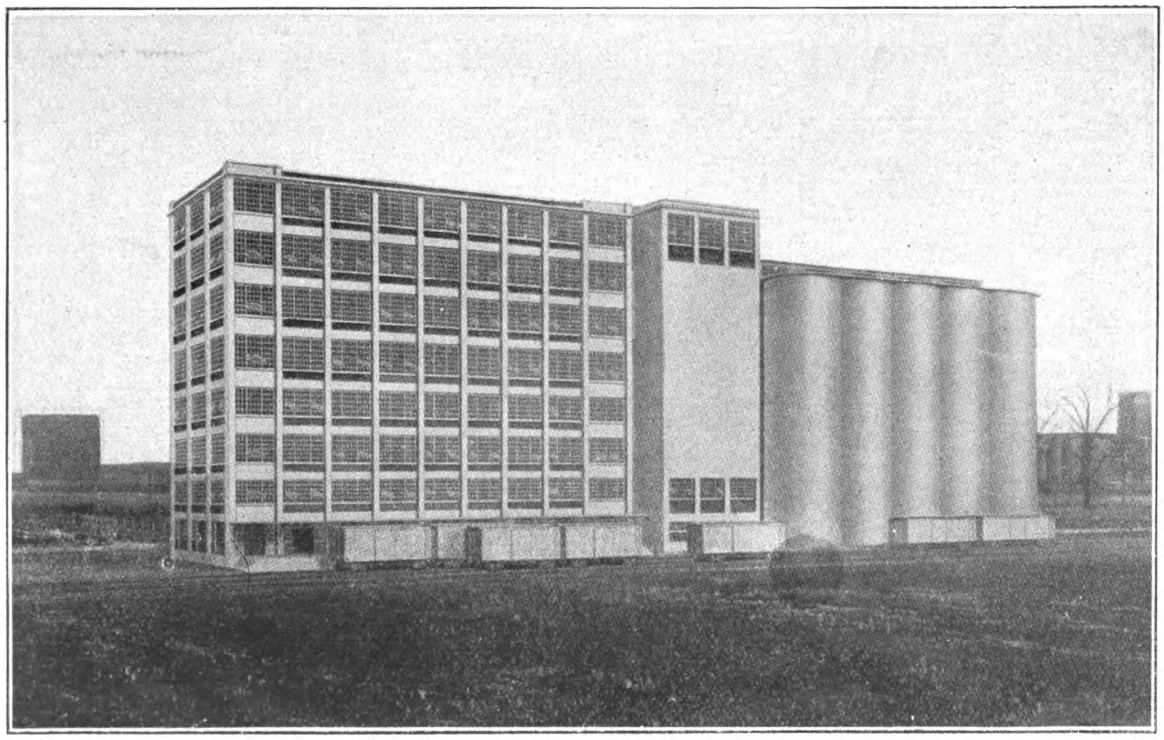
generally, however, it is handled in bags from the farm to the mill.

On first arriving in China the writer was taken through the flour mill district. Accustomed to modern flour mills in North and South America where every five to eight storey flour mill building has its grain storage elevator towering equally high alongside, the flour mills in China always seem incomplete. But passing within the compound walls one sees a whole brood of low one storied godowns. Inside of these godowns every day in the year one sees a small army of coolies, each sweating and grunting under an enormous bag of wheat. One long line is coming from a big junk out in the canal two or three hundred yards distant, and they are stacking these bags into a huge pile that finally reaches to the rafters of the godown. On the other side of this godown another group of coolies is tearing down another huge pile of sacks and "dog trotting" with their burden of wheat into the cleaning department of the mill, perhaps 100 yards distant. A newcomer to the Orient is simply amazed at the swarm of coolies.



The Dairi Flour Mills at Dairi, near Moji, Japan. Capacity, 3,000 barrels wheat flour per day of 24 hours

A 1,000 barrel flour mill in America is operated by a total of 20 to 30 workmen who man both the elevator and the mill and the use of 130 to 160 men to do the same work in China seems almost like criminal waste. In America an efficient mill superintendent will spend hours trying to cut down labor and operating costs to a minimum, whereas in China a flour mill frequently seems to be considered a sort of benevolent institution where a place must be found for all of the poor relatives of the directors, manager, submanager, superintendent, and so on. For instance, after a brief survey of a flour mill that was reported to be having hard sledding, a recommendation was made to the manager and mill superintendent where, by a few changes in their wheat receiving bins which meant increasing the capacity, they could do away with the services of twenty coolies. This mill had been installed under the supervision of a Chinese coolie miller, who had convinced the manager that he was an expert in these matters, but due to oversight on his part in not providing adequate receiving bin storage, that mill had been hiring sixteen coolies at a cost of over $200 a month for four years, to keep these bins full. There was plenty of room available and a sketch was made out with full directions in Chinese giving the necessary data. Four months later when asked why the scheme had not been carried out as planned, the manager explained that the poor coolies needed the work and that he felt it his duty to do his part by keeping them on—otherwise they would starve. Yet he was complaining of high operating cost of his machinery. The fact remains that this mill worked 80 men in the mill and 28 in the office to carry on a business that in America is done with a total of 16 men.



A MODERN AMERICAN FLOUR MILL ERECTED BY NORDYKE & MARMON CO.

Larrabee Flour Mill, St. Joseph, Mo., U.S.A. Capacity, 25,000—50-lb. bags per day

Here are shown the 8-storey Mill Building, the separate Wheat Cleaning House, and the Grain Storage Silos of a typical mill in the United States. All wheat is handled in bulk. The Silos have a capacity adequate to supply the mill for many months. This plant is designed along scientific lines that permit the daily handling of enormous quantities of both wheat and flour, and with the minimum amount of labor.

Chinese Wheat

Taking it as a whole, a great deal of the Chinese wheat is as good as any wheat in the world, but due to the primitive methods of harvesting with flails and stone rollers, and also due to the accumulation of foreign materials *en route* to the mill, Chinese wheat as actually received at the mill contains the highest percentage of foreign matter of any wheat in the world. Regarding the "accumulations *en route* to the mill" this takes place in various ways peculiar to China. In some cases, weed seeds, fine gravel and dirt is added to the wheat by the local guilds of wheat buyers who thus derive an illegal profit. In other cases a large junk will be

loaded with a cargo of wheat in bags and consigned to some mill or godown several hundreds of miles distant. The one in charge is not provided with any money to pay taxes, consequently when he is stopped at various likin stations along the route and a tax exacted, he pays it in wheat. However, he is expected to deliver a certain number of bags of wheat of a certain weight to the mill at destination. So a stop is made at certain points a little past the likin station, or at the station itself, where convenient piles of fine rock, gravel and worthless seeds are to be found. But he always delivers his cargo complete and even sometimes, a little over weight. Due to the high percentage of trash in this wheat as received at the mills, the system of cleaning machinery as specified for flour mills in China is very elaborate, and generally speaking, includes twice as many machines as are required for mills in America.

Cleaning and Preparation of the Wheat

The uninitiated may well wonder why a flour mill of any size is always from 4 to 8 storeys high. Take for example an 800 barrel wheat flour mill. The system is quite long and complicated and a total of from 80 to 90 different machines are required to clean the

CORN AND WHEAT FLOOR MILL—Hand Power

Before grinding, in the case of corn, the grain is placed in a large earthenware jar and immersed in water from 12 to 18 hours.

The lower grinding stone is stationary. The upper stone, which has an opening in the centre to admit the grain, is turned by two coolies. The ground product oozes out between the stones and falls on the circular table, from where it is scooped up and emptied into hand sieves clothed with bolting cloth made from horsehair. For a primitive mill, this one is somewhat elaborate, as when grinding corn, the grain is ground and sifted three times before the desired fineness is obtained.

The finished product, being very damp, will not keep but three or four days, so this highly perishable product must be disposed of as quickly as possible.

wheat and convert it into flour, to say nothing of 35 to 40 elevators for the elevation of the products, eight or ten conveyors, transmission machinery, bins and a maze of spouting, wind trunking and other accessories. For a mill of this size American practice in China usually calls for a building 5 storeys high. The cleaning department occupies about one-third of the building, the milling department the other two-thirds, and in each department all five floors contain machinery. A partition wall, or a well between two walls usually separates these two departments, with doors connecting on each floor. In case of a fire in either department this partition serves as a protection. There is always considerable dust in the air of the cleaning department of a mill in China due to the very dirty wheat, and the partition helps to confine this dirt and dust to the cleaning department. In a properly constructed mill, however, this dust can be reduced to a minimum.

On the ground floor of the cleaning department is a wheat sink or receiving hopper where the coolie empties his bag of dirty wheat. This hopper which has a slant bottom discharges into a large capacity elevator by means of which the grain is elevated to the 5th floor and after being weighed in an automatic weighing machine, is discharged in a steady stream into a preliminary cleaning machine called a receiving separator. In this machine the wheat is aspirated for the removal of light weight impurities, such as dust, chaff, screenings, etc., and passes over a series of sieves with different sized perforations by means of which any impurities either larger or smaller than a grain of wheat are graded out. The dust which is removed by a powerful suction fan is blown into a metal dust collector, and the chaff, screenings, small seed and large trash such as sticks, stones, pieces of coal, etc., are each removed separately in a very efficient manner and spouted to the refuse room down below. From this machine the wheat goes to a large receiving bin. This bin is usually of sufficient capacity to supply the mill with at least enough wheat for a 24 hours run. This bin, like all of the bins in the mill has a slanted bottom, so that when the miller or operator opens a valve the bin discharges itself automatically . It is at this point that the miller takes wheat for the mill as he needs it.

The grain passes by means of a conveyor to another elevator, the second in line for instance, is again elevated to the 5th floor where it is discharged into another separator called a milling separator. This machine is somewhat similar to the first one but arranged with finer sieves and designed to make a much more perfect separation of the foreign materials from the wheat. Four or five different classes of offal are removed by means of this machine also, the lighter weight materials by the suction fan, the others by sieves, and each class comes out separately in the form of sticks, stones, wild peas, corn, etc., wheat screenings, cockle and other fine seeds, chaff and dust. With reference to this last product, the dust, every one of the cleaning machines is connected by means of wind trunking to a separate dust collector. That is, every machine has its individual dust collector which does the work that its name implies, collects the dust. Without these collectors the cleaning department would soon look like the Gobi Desert in a dust storm.

From the milling separator which may be on the 4th floor the wheat drops down through a spout into another cleaning machine on the floor below called a cockle machine. The speciality of this machine is the elimination of small round seeds, smaller than the length of a grain of wheat such as the cockle, mustard seed, and various other small seeds which are present in considerable quantities in most China wheat. The cockle is a very bitter tasting seed which will seriously affect not only the color but the taste of the flour if not eliminated.

From the cockle machine on the 3rd floor the stream of wheat drops down through another spout into another machine on the floor below, called a scourer. Like the two separators mentioned above, this machine is equipped with a powerful suction fan and the stream of wheat on being spread out is subjected to a strong aspiration both on entering and on leaving the scourer to remove dust, chaff, screenings, wheat dust, etc. Inside are cast iron conveyor beaters which convey the wheat through the machine, at the same time subjecting it to a scouring and rubbing action against the slotted uneven surface of the outer case. This knocks loose the dirt in the crease of the grain and scours off the fuzzy hairy beard and branny chips from the outer hull of the wheat. This fine light brown offal is aspirated out of the wheat by the time it leaves the machine. The upright Prinz type of scourer is usually equipped with a gang of magnets which remove nails, bolts and other foreign metalic substances.

If the wheat is dry and brittle, or if it is hard wheat, and too hard to grind as it is, water must be added and after again being elevated to the 5th floor, the grain is delivered to a tempering bin to lie a certain number of hours. The amount of water and the number of hours the wheat is tempered is a point to be decided by the miller. In America or in Europe where flour milling is conduct- on a very scientific basis, great stress is laid on the vital importance of proper tempering. It is so vital that improper tempering or the omission of tempering means success or failure in making a pure white flour. In China, there is a tendency among native millers to ignore this important point, which is one of the reasons why nearly all Chinese flour is darker than imported flour. There are other reasons among which might be mentioned the tendency to overcrowd the system. The owners will approach the engineer and ask for machinery adequate to produce 1,000 barrels of flour. Machinery to make that quantity is installed in a system that will make flour of a quality equal to any in the world. These mills are always good for a reasonable overload and would still produce quality flour, but the owners, or the Chinese miller, are not content with a 10 or 15 per cent. overload. They put on coarser

bolting cloth, and overcrowd the machinery to the utmost until they obtain as high as 50 and 60 per cent. overload. Such an overload is not obtained without a corresponding sacrifice in quality.

In the warmer climates where the wheat is comparatively soft, starchy, and with a low gluten content, very little tempering is necessary, but the hard northern wheat should undergo considerable tempering before milling. Volumes could be within on this important subject, which has been only touched lightly in this article.

Assuming that the wheat is to be tempered 24 hours, a bin adequate to contain enough wheat to feed the mill for that many hours would be necessary. This bin is kept full. It has a valve at the bottom and wheat is pouring in at the top at the same rate as it is running out at the bottom.

After tempering, the wheat is usually put through one or two additional scourers. During the tempering process the outer hull of the wheat has been softened and loosened and these two scourers do good and efficient work in scouring and rubbing off these loose particles as well as the beard of the grain.

After passing through the two scourers the wheat goes to a brush machine. This machine is built along the same lines as a scourer except that the wheat passes between several sets of closely adjusted brushes, one fixed and one revolving at a high rate of speed. The stiff bristles of these brushes are designed to give the wheat a last brushing and polishing, and to remove the fine dust from the crease of each grain.

The wheat now passes through a Richardson automatic mill scale, which is set to weigh a half bushel of wheat at each draft. An automatic numbering device on the scale records each draft, and by reading this dial the miller can check up at any hour of the day exactly how many pounds of wheat he is milling per hour. By comparing the reading of this scale with the reading of the scale which weighed the dirty wheat he can ascertain to a pound how much offal has been removed from that wheat by the cleaning department.

The wheat now passes through a pair of wheat steamers where heating or steaming is applied to bring the moisture applied by the tempering to the surface of the hull and toughen it so that it remains tough and does not pulverize on being run through the corrugated break rolls. From the steamer the wheat passes to a small bin and to a wheat governor which automatically maintains a uniform feed of wheat hour after hour, and into the first break rolls for the first crushing.

In the system briefly described, the elaborate preparation of this stream of wheat which we theoretically have been following has required 48 to 50 hours from the time it was dumped into the wheat sink by the coolie. That coolies hands were the last to touch the wheat. It was necessary for him to cut the bag open, but there is no further human contact or handling in this process. In fact, the manufacture of flour is designed to be one of the cleanest of all as regards the preparation of food for human consumption.

Once the wheat is emptied from the bag into the wheat sink or receiving hopper of the mill, no human hands come in contact with the product until the tightly closed bag is opened, either in the bakery or in your own kitchen, revealing the pure white product that is used for making " the staff of life." The proper preparation and cleaning of the wheat is of vital importance—the essential foundation on which the making of good flour is so dependent.

Looking back over the route the wheat has traveled, flowing by gravity from one machine on the top floor through successive machines on lower floors, it is possible to see the advantages as well as the necessity of having a building several storeys in height. At that, the flow has only been roughly traced through a dozen of the 80 or 90 machines that comprise the mill.

Milling the Wheat

To describe properly the long complicated system of milling the wheat from the time it goes into the first break rolls of the milling department until it is reduced to flour and the by-products of the system would take considerable space, so only a very brief outline will be attempted in this article. Briefly, the process consists of breaking up the wheat on corrugated rolls, separating the heart of the grain, the broken up particles of which are called "middlings," from the hull, classifying and purifying these middlings by means of sifting machines and purifiers, and then breaking down or grinding these middlings on scratched or smooth rolls, until by a process of gradual reduction all the flour has been separated.

A mill of the size described might have from four to six break reductions which call for corrugated rolls to break up the wheat and gradually remove the interior or heart from the hull, and from 10 to 15 additional reductions or classifications of stocks known as sizings, tailings, middlings and low grades, which call for the use of scratched or smooth rolls.

After each classification has been ground on a pair or pairs of rolls, it drops down through an inclined spout, flowing by gravity to an elevator allotted to that particular stock. This product is then elevated to the fifth floor, discharges into another inclined dust proof spout, and passes to a certain section of a sifting machine. This particular section consists of number of sieves clothed with silk bolting cloth of different meshes by means of which the stock is separated into four or five clean cut classifications of coarse and fine middlings, besides one very fine, white and pure classification which having passed through exceedingly fine mesh silk is known as flour. This stream of flour joins other streams of a similar grade of flour from a dozen other sections and drops down through a spout to the packer on the ground flour. The other classifications of middlings, each being of a different fineness, join with similar stocks from other sifter sections and drop down into a purifying machine on the floor below.

In this machine, which has a long horizontal shaking sieve clothed with silk bolting cloth of different meshes, the middlings are re-sifted and at the time subjected to an aspiration from a suction fan which removes the light brown bits of hull, fibre, dust and other impurities. From this machine the various grades of middlings drop down through a spout to the grinding floor. The coarse middlings all go to one pair of rolls, the medium grade to another, the fine to another, etc. etc. And so the intricate process is carried on, grinding, sifting, elimination of the flour as a result of that grinding, purification and resifting of what is left and again back to the rolls, until after a process of gradual reduction and after having passed through thirty to forty pairs of rolls all of the flour has been completely extracted. This flour is usually graded as No. 2, No. 3 and No. 4 The bye-products from the milling department are bran, shorts (fine chopped up bran) and fibre, commonly known at home as " ships stuff." In China this latter, a brown colored product, is passed through a No. 66 mesh cloth and sold as "No. 4 Flour."

The extraction or yield of flour in China is very high, too high really for any other country, as it will run from 77 to 83 per cent. In America, where competition is keen and the consumer's demands for a pure white flour are higher, the usual extraction is 72 to 74 per cent. which is all the white flour that a No. 1 grade of wheat contains by analysis.

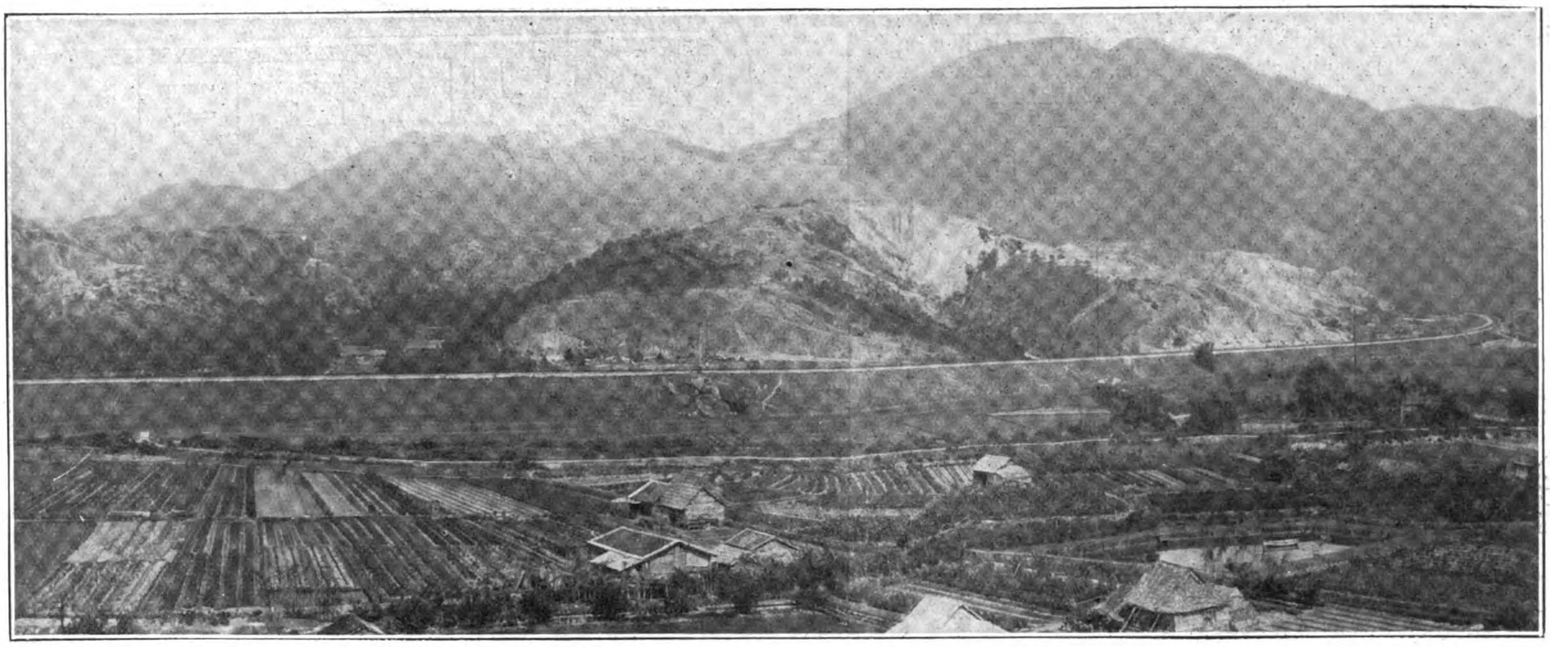
Mill Superintendents

In the flour milling industry in China, the crying need is for competent technical mill superintendents.

During the past ten years, a surprisingly large number of mills have gone up, and the snpply of good millers to operate these mills has never been adequate to meet the demand. A competent head miller is not turned out in a day, nor in a year. In America or England, a mill operator has to serve a long apprenticeship of at least four to six years before he is considered fit to serve as second miller. A further period as second miller is necessary before he can become a head miller or superintendent. The flour milling industry has advanced by leaps and bounds during the past quarter of a century, and as its wonderful and intricate system has been developed, a demand has been created for highly trained experts of the finest calibre to man its mills.

We know of one progressive mill owner who has sent two Chinese students of the gentry class to America, where they are taking a four years course is flour milling in one of the large universities. After their four years course is up, they are to spend an additional two years getting practical experience. From such as these we may expect big things in the futuie, but they are all too few.

In the absence of a proper technical school for training of mill superintendents in China, the next best scheme would be to have more foreign experts from home, who in turn could teach the more clever among the native element, until there are enough competent Chinese millers to carry on the work.



Site for the Kowloon Tong Garden—Developed by the Kowloon Tong Co. and The New Territory Development Co.

Kowloon's Garden City

Builders Delays Hold Up Completion of Mr. Montague Ede's Housing Scheme

SELDOM indeed in this life does a man see his dream come true when it is a dream for himself and even less seldom when it is a dream for others, and this failure of philanthropy to work out is again exemplified in the case of Mr. Montague Ede and his Kowloon housing scheme. Mr. Ede has just retired from his post as general manager of the Union Assurance Society of Hongkong but he has not retired from his overlordship of the housing plan, in fact, he says he intends to finish it despite all and any adverse influences, such as the builders monopoly that now grips Hongkong.

This scheme, known as the Kowloon Tong, had as its objective the furnishing of 250 families with houses at a reasonable rental and amid proper surroundings, homes of which the householders could justly be proud. It was started in 1921 and after arrangements had been made with the government of the colony, applications were invited. Before the first sod was turned, more than the allotted number had applied for the houses. That was two years ago and it was confidently expected that before now the garden city would be in operation. But they reckoned without their host, in this case the builders combine of Hongkong.

In January, says the *China Mail*, Mr. Ede was able to announce that 56 houses would be completed by June, and he expressed his satisfaction at the progress of the scheme. The fifty-six houses would be built on all the land available at the moment. Mr. Ede later cut down his estimate and announced that twenty houses would be ready in July. The company had met with serious delay from the building contractors—the usual building trouble in the colony, as Mr. Ede characterised it. Mr. Ede said rather sarcastically that instead of having a gang of men working regularly on each house they had " an amah and two boys and even they were always quarrelling." Mr. Ede pointed out that there was virtually a corner in the building market just now. About half of the building contracts were held by two contractors, who sub-let the work to sub-contractors. It was not the actual workers who were causing the delay but the contractors. The guilds were powerful and he implied, almost autocratic.

To the suggestion that workers from outside could be brought in, Mr. Ede said if they were they would have to lock them up in cages and confine them from the rest of the population in order to prevent inevitable trouble they would meet from the local workers. Had the work been carried on steadily from the time it was started, added Mr. Ede, the fifty-six houses would have been ready. There was a striking indication of the delay that had been experienced in the fact that instead of fifty-six houses being ready in July only 20 would be ready. Mr. Ede said he had been trying to communicate with the contractors to speed them up. In spite of the delay, Mr. Ede was assured that by the end of this year, a third of the total scheme would be completed and the remainder in eighteen months' time. This assurance doubtless will be received with gratification by the prospective tenauts who " booked " their houses more than three years ago.

China Begins Strawboard Manufacture

(Continued from page 500).

line shaft with a rope drive, supplying power for the straw cutters, rotary digestors, beater engines, Jordans and stock pumps, calendars and paper cutters. One small vertical engine is used for operating a centrifugal pump which distributes water from the creek throughout the plant. The paper machine is driven by a double cone drive from a small vertical steam engine said to be of 50 horse-power. Most of the machinery is belt driven, the notable exception being the beaters which have rope drive.

Owing to exceptional circumstances a fair estimate of cost of plant and running expenses was obtained from Chinese sources. The plant, including engines and boilers, machinery for making the strawboard and accessories cost approximately Mex. $270,000. The land cost about Mex. $12,000, the buildings Mex. $60,000 and the working capital was about Mex. $18,000. As this plant was projected some years ago, these prices probably could not be

duplicated now, especially since the paper machine was of Japanese manufacture and much lower in price than a similar one of American or British manufacture would be. At that time the exchange also was low so that a much greater value in machinery was obtained for the money expended.

From the same source a statement regarding the daily operating cost was obtained and while it is probably fairly accurate, some items may have been, and probably were, overlooked. It is as follows :
Revenue from 12 tons of strawboard per 24 hours at

Mex. $100 per ton		Mex. $1,200
Daily Expenses		
18 tons of straw at Mex. $0.40 per picul ..	Mex. $121	
Lime six piculs at $1	6	
Coal, 17 tons at $12	204	
Foremen and fitters 20 at $1	20	
Laborers 80 at 40 cents	32	
Depreciation of felts ($3 a ton)	36	
Interest	120	
Salaries and overhead	161	
	——	700
Showing a net profit per diem of		Mex. $500

These figures have been checked so far as possible and appear to be accurate, especially as regards cost of materials and labor, but they are published more as a guide to possibilities than to show the workings of this particular company. The profit of Mex. $500 a day doubtless will be largely exceeded in countries where coal and labor costs are more advantageous, for it is only $150,000 for the 300 day year which is barely forty per cent. on the $360,000 invested.

In addition to the two new strawboard mills mentioned above, the Tsung Hwa Cardboard Factory capitalized at $500,000 fully paid up, has started operation in Tientsin. The plant has a capacity of 14 to 15 tons per day. The company also maintains a selling office in Shanghai.

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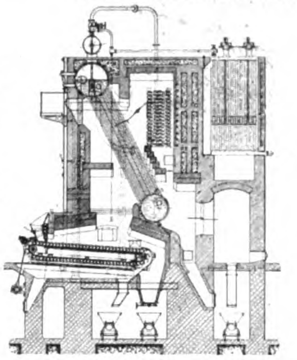

Section through single bank boiler with mechanical stoker economiser, etc.

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Engineering and Industrial Notes

ELECTRIC

ELECTRIC LIGHT FOR KIANGPEI.—A proposal is afoot at Kiangpei, Szechuen province, for the establishment of an electric light plant under the name of "Yu Pei Electric Light Co." Lu Chao-ching has charge of all preparations. To start with, the plant will be run on a more or less experimental basis, limiting its capacity to 500 lamps.

ELECTRIC POWER IN TIENTSIN.—The Tientsin chamber of commerce is negotiating with the city electric light company for the use of electric power in the local flour mills instead of animal power.

ELECTRIC LIGHT CO. IN CHEKIANG.—A new electric light company known as the Wuyi Electric Light Co., has been organized at Wuyi, Chekiang province. The company's stock has been fully subscribed and equipment for an electric plant is to be ordered.

KALGAN ELECTRIC LIGHT CO.—The electric light company at Kalgan recently installed a new generator to supply the increasing demand of the city. The company's old generator is capable of producing current for 5,000 lamps only. The number of lamps in the city has grown to over 10,000.

ANKING ELECTRIC LIGHT CO.—Since its management has been handed over to the merchants, the Anking Electric Light Co. has been re-organized and the directors plan to go to Shanghai for the purchase of additional electric machinery.

WATER POWER SCHEMES IN THE F.M.S.—Messrs. Armstrong Whitworth's experts are at present investigating the large water development schemes connected with the Sungei River, Batang, Badang and Sungei Woh. The total horse power to be obtained from these schemes in their initial stages will amount to about 25,000 h.p.

CEBU PLANT ENLARGED.—An electric plant, producing current more economically than any other plant in the Philippines, is to be erected by the Visayan Electric Company of Cebu, according to information given out here by the Koppel Industrial Car and Equipment Company. The plant is to be in the form of an addition to the present plant of the Cebu Company and will more than double the present capacity of the Cebu Company's present unit. The Cebu Company has signed a contract with the Koppel Company of Manila for the installation of the new machinery. The main unit will consist of a 550 horse-power stationary Diesel engine connected with a Swedish General Electric Company alternator. The plant will be constructed for parallel operation with the present plant. The Diesel engine to be installed is declared to be the largest which has yet been brought into the islands and will produce current at lower cost than any existing plant.

ELECTRICITY FOR FENGHUANGCHENG.—Fenghuangcheng is to have electric lights bringing to fruition a plan conceived in 1916. The promoters are raising a capital of about Y.18,000. Necessary materials have already been purchased at Antung. The new works will start with about 2,500 lamps to be served.

JAPANESE DEVELOPMENT.—"The future industrial progress of Japan must largely depend on the development of hydro-electricity," said Mr. Keijiro Inouye, president of the Tamagawa Electric Power Co., "and Japan is fortunate enough to own immense resources to develop all the necessary water power to electrify her industries." According to Mr. Inouye's own investigation, capital aggregating Y.2,200,000,000 is involved in the hydro-electric development although paid-up capital is estimated at but Y.1,700,000,000. Beside, there is another Y.415,000,000 invested in debentures of different companies engaged in the development of water power which number 500. These hydro-electric development companies are supplying to-day some 3,000 different establishments with power. Of these 500 hydro-electric companies, 295 are paying 10 per cent. and 94 companies 8 per cent. dividends per annum on capital invested, while 109 companies have not so far declared any dividends.

"Some 6,650,000,000 horse-power is developed by hydro-electricity and consumed yearly in Japan for industrial, lighting and transportation purposes," said Mr. Inouye, "and of this, 4,700,000,000 horse-power is utilized in industrial establishments, 1,300,000,000 h.p. in developing 21,000,000 lights which represent 310,000,000 candle powers, and 500,000,000 h.p. in running something like 52,000,000 electric cars on tracks extending 2,000 miles in all."

INDUSTRIAL

NEW CANNING COMPANIES.—The Chung Hwa Canning Co., Ltd., is being organized in Shanghai to can fruits, vegetables, meat and poultry. It is to be capitalized at $100,000, to be secured from 5,000 shares of $20 each. The company's preparation office is at 64 Tientsin Road, Shanghai. Yang Shou-chang and Wu Yu-sung are in charge of promotion. The Tao Hua Canning Company recently established a factory at Wenchow. This plant has a daily capacity of 3,000 tins of meat and vegetables, which are exported chiefly to Amoy.

LEATHER MANUFACTURING CO. IN FOOCHOW.—The Ta Fu Leather Industrial Co. has lately been established at 9 Front Street, Fan Chu'an Pu Nantai, Foochow. The manager is a returned apprentice from Japan. Manufacturers consist of leather trunks of both Chinese and foreign style, hand bags, cases and boxes for military and naval purposes, toilet caskets and belts, etc.

SOCIETE TEXTILE FRANCO-CHINOISE.—The Societe Textile Franco-Chinoise has recently been established in Shanghai by Sino-French capital to engage in textile dyeing. The works are to be located on Pai Lien Ching, Pootung, where the company owns a 24-*mow* site. The town office is at M14 Foochow Road, Shanghai.

A LARGE CONTRACT FOR NEWSPAPER-MAKING MACHINES.—Messrs. The Oji Paper Manufacturing Company of Japan, have recently placed an important order for a newspaper-making machine with an English Company, Messrs. Charles Walmsley & Co., Ltd., who are now one of the group of industries controlled by the Armstrong Whitworth parent company.

Messrs. Walmsley & Co., Ltd. are the leading manufacturers of this class of machine in England, having since the war built no less than 30 machines, most of them of huge dimensions and capable of producing a sheet of newssprint 220-in. wide at a rate of 1,000-ft. per minute.

The new machine for the Oji Company will be driven by individual sectional electric motor drive, with patent control to maintain the speeds of the motors absolutely constant.

The value of this contract amounts to some £60,000, and we understand that the same company are now negotiating for a very large machine also destined for Japan, the price for which runs into very much higher figures than the above.

CEMENT PLANT FOR CHOSEN.—A plan is maturing in Chemulpo for the establishment of a cement factory. Demand for cement is large in Chosen, considerable quantities being required in irrigation and other engineering cement production works. Promoters of the plan claim that their object is to insure self-sufficiency of cement for the peninsula. The proposed factory is to be established at Nekojima and material obtained from Hashu and Kaijo districts, Keiki province, where exist such large beds of limestone that the factory can depend on them operating for some two hundred years to come. A joint stock company capitalised at three million yen will be organized in Seoul to carry on the enterprise. Of its 37 promoters seventeen are Koreans and the rest Japanese.

HONGKONG'S NEW ICE PLANT.—The Dairy Farm, Ice and Cold Storage Company, Ltd., have just completed the erection of the new ice factory, at East Point which in the matter of equipment probably is superior to anything of its kind in the Far East. In March, 1923, the company contracted with the Hongkong Engineering and Construction Co., Ltd., to remove the old structure and erect an up-to-date reinforced concrete building which cost about $270,000. It accommodates not only the new ice plant and ice tanks but also has on its top floor two sets of quarters for the resident engineers. Further, it provides us with 260,000 cubic feet of extra refrigerating chambers for storing meats, butter, fruit, etc. The new plant consists of two 80 tons (refrigerating) York machines each driven by a 180 h.p. motor and capable of turning out 80 tons of ice every 24 hours. The company now can produce 150 tons of ice per day and also provides 400,000 cubic feet of refrigerator space, divided into 18 stores for storing various kinds of foods. Messrs. Andersen, Meyer & Co., Ltd., the local agents of the York Manufacturing Company, supplied all the machinery. Connected with the new plant are about 40 General Electric Company motors of various sizes represenlng about 535 h.p. The whole plant will be run on current supplied by the Hongkong Electric Company. The plant with the necessary accessories cost about $450,000, making a total cost of $720,000 for building and plant.

TRAMWAYS

KOBE-OSAKA LINE.—Plans for a 10-storey terminal building inOsaka and a centrally located terminus in Kobe have been announced by the Hankyu electric line operating between Kobe and Osaka. The Kobe terminus plan, calling for the construction of a two-mile tunnel from the present terminus at Kumochi, just within the city limits, to the heart of the city has been drawn up and authorized by the department of communications. The tunnel will be constructed at an estimated cost of Y.10,-000,000. At present the Hankyu terminal in Kobe is at Kumochi about two miles from the business centre of the city and passengers returning from Osaka must take the city tram line to reach the business district, a ride of from 10 to 15 minutes. Elaborate plans for improvements in Osaka are being projected but as yet have not been authorized by the government. The present congestion of traffic between Juso, the junction for the Hankyu branch lines to Sengiyama Takarazuka, and Osaka has become so great that the company plans to add two more tracks from Juso to Osaka. They also hope to complete their plans for a 10-storey terminus building, housing a modern hotel, department store, restaurant, waiting rooms and offices for the company officials. The Hankyu line maintains a 40-minute schedule between Kobe and Osaka with electric trains leaving every four to six minutes during the rush hours in the morning and evening and every five to seven minutes throughout the day.

TRAMCARS FOR NANTAO COMPANY.—Tenders for the supply of 12 tramcars were recently asked by the Chinese Electric Power Company, Ltd., Nantao, Shanghai. The company plans to extend its services between Nantao and Shanghai.

ANTUNG-WIJU STEAM-MOTOR CAR LINE.—The steam-motor car service between Antung and New Wiju across the Yalu railway bridge has been started. The New Wiju-Shahochen (the station next Antung) route will be divided into two sections. The Shahochen-Antung section will form one section, and the Antung-New Wiju, another.

RAILWAYS

PEKING-MUKDEN DOUBLE TRACKING.—Mr. Shui, managing-director of the Peking-Mukden railway, in a petition to the ministry of communications concerning the construction of a new station between Yangtsun and Tientsin, says that as the government had already decided to build a double track for the Peking-Tientsin section of the Ching-Fen line, provision should be made to construct the new station in such a way as to accommodate increased traffic. Mr. Shui urges that the budget for building the station be increased in $60,000 instead of $48,000 as sanctioned by the Chiaotungpu previously.

In connection with this report, infcrmation from the Chiaotungpu says that the government, in view of the increased traffic between Peking and Tientsin, is inclined to accept the proposal of the director for the construction of a double track and that work will commence as soon as funds can be secured.

KAIYUAN-TAOLU LINE.—Referring to the proposed construction of a light rail line between Kaiyuan and Taolu, in the Tungshan (Eastern Hill) district, the tenders for necessary materials have been awarded to the Wato Yoko, a Japanese firm of Changchun.

S. M. R. NEW CARS.—Three new observation cars are under construction at the South Manchurian railway workshops, Shakako. They are for the S.M.R. main line to replace in November next cars now in service, which will then be transferred to the Chosen line.

TELEPHONES AND TELEGRAPHS

PHONE SERVICE FOR LIAOYANG.—The Chinese Telephone Office, Liaoyang, has opened part of the new telephone service installed within the walls to traffic. It planned to throw open the entire system to business from October 1. The Chinese government offices and business houses having relations outside the walls and the railway town continue to make use of the Japanese telephone service, which is thought to be affected but little by the establishment of the Chinese system.

NEGROS P. I. PHONE CO.—Prominent American and Filipino business men in Negros Occidental combined capital to establish the "Negros Telephone and Telegraph Company" in Bacolod, Occidental Negros, has been incorporated with a capital stock of Ps.500,000, divided into 5,000 share at Ps.100 each. Theo. Vail Ralsey, Geo. J. Petty, S. Javier, L. Atotubo, T. Sevilla, R. Barcelona, and J. E. H. Stevenot, who is also the treasurer, are the directors of the new firm. The capitl subscribed at the time of its registration amounted to Ps.200,000 and capital paid is Ps.50,000.

CHOSEN-MANCHURIA LINE.—By the end of October, the new Pingyang-New Wiju telephone line will have been completed by the Chosen government. This will supply the last missing link between the through long-distance telephone service between South Manchuria and Chosen, in connection with the Mukden-Antung line installed in December, 1920. On the completion of the through line, traffic will be opened between Mukden and Pingyang and between Antung and Pingyang and Chinnampo.

LONG-DISTANCE SERVICE.—The long-distance telephone between Nantungchow Chungming, and Haimen, Kiangsu province, is now in use.

CHOSEN-MANCHURIA, PHONE SERVICE.—The projected telephone service connecting Chosen and Manchuria is expected to be completed in November, work on the section between Heijo and Shingishu now going rapidly.

HSUCHOW AND HAICHOW LINE.—Seeing that the section of the Lung-Hai Railway between Hsuchow and Haichow, Kiangsu province, soon will be completed, the ministry of communications has decided to set up a new telegraph line between these two cities. At present messages from Haichow to Hsuchow or vice versa are despatched via Tsinkiangpu.

NEW LOYANG LINE.—Some time ago, Gen. Wu Pei-fu requested the ministry of communications to instal a long-distance telephone system between Loyang and Kwanyingtung, exclusively for his use. This service is now in course of completion.

SHIPPING

N.Y.K. ORDERS LINERS.—The Nippon Yusen Kaisha placed an order recently with the Yokohama Dock Company for two new passenger steamers. The new liners are to be placed on the run between Kobe and Shanghai and are to be placed in commission in one year. They are to be of 3,100 tons gross and have a deadweight tonnage of 3,900 tons with a speed of 15 knots. Passenger accommodations will be provided for four in the first cabin and 90 in the steerage.

O. S. K. BUYS NEW SHIPS.—Plans for the material improvement of the Osaka Shosen Kaisha's South American passenger service has been announced as the result of the adoption at the last session of the Diet of the governments policy to concentrate its available energy on the transportation of Japanese emigrants to South America. The Osaka Shosen interests have asked Y.6,500,000 from the Mitsubishi management. It was decided in negotiations that the firm could float debentures to that amount on acceptance by the Mitsubishi Bank. The ships will be constructed at the Mitsubishi Shipbuilding Yard, in Kobe. The keels of the first liner will be laid down in the near future. Debentures will also be floated in course of time. Each ship will have 7,300 tons gross and 12,200 displacement tonnage with a total carrying capacity of 8,400 tons. Each ship will be equipped with refrigeration capable of accommodating 250 tons. The ship will carry 40 cabin passengers and 780 in its steerage. Maximum speed be 16 nautical miles an hour. The service is now cared for by two ships. The completed fleet will consist of five ships. Ten round trips will be made by each yearly. The present trip, requiring 64 days, will be shortened to 45 days. The first ship will be finished in October, 1925, and the second one in February, 1926. The third and last ship will be completed in June, 1927.

S. M. R. CO., NEW COLLIER.—The new S. M. R. collier *Bujun Maru* has been launched at Schiedam, Holland, and will proceed to Dairen under her own steam. The main object of the vessel is to load coal into ocean-going vessels, either inside or outside the harbor, which are not alongside the wharf. Details of the new collier are as follows: Hold capacity, 1,000 tons; fitted with automatic conveyor and self-registering weighing machine; discharge of coal from hold by bunkering ladder and telescopic shoot into bunkers of ships being coaled. The hull is divided into self-emptying hoppers, the bottom of each being equipped with vertically opening sliding doors to communicate with a tunnel on vessel's keel; at bottom of tunnel and further along inclined bunkering ladder, is an endless conveyor to which an endless trough is bolted, divided into series of pockets by means of upright standing plates; the coal slides through hopper doors into these pockets and before it passes to the inclined bunkering ladder, it is carried over self-registering weighing machines. The vessel is fitted with two vertical compound condensing engines, each developing about 250 I.H.P.

SHIPPING COMPANY IN MANCHURIA.—Authorities in Manchuria are planning to organize a shipping company for the three eastern provinces. The company is to be started under official auspices and to partake of the nature of an official organ. It is to have control over all shipping affairs on the Liao, the Sungari and the Amur rivers. Kwei Sheng, former civil governor of Kirin, has been nominated director of the company.

MINES

GOLD MINING ABOUT AIGUN.—Developments in the gold mining industry about Aigun during 1923 were the brightest feature of the year's trade, says Mr. R. F. C. Hedgeland, commissioner of customs. The gold output was 136,169 troy ounces, valued at Hk. Tls. 3,235,900, of which three-quarters came from the Feng Yuan Gold Mining Company. In 1918 this concern took over two smaller operators, and in 1922 rich deposits were found at Wutakow and Chutuho, where new towns have grown up in the last 12 months. The commissioner says the difficulty of transport over bad roads restricts operations, and the need of a railway to serve the district is becoming urgent.

NEW COLLIERY IN KIRIN.—Last spring, two Japanese of Mukden struck a coal mine at Tashahotzu in Itung, Kirin province. This find is said to be of a considerable magnitude, giving coal of good quality. With several Chinese, they founded a company under Sino-Japanese joint management capital of S.Y.100,000. A gang of 12 Japanese miners, besides 160 Chinese, were put to the work of experimental mining. A layer of coal, about 7-ft. in thickness, has been struck at 35-ft. underground. This seam is reported to extend over a large area, and is said to promise great possibilities. The management has approached the S. M. R. Co., to lay out a coal yard in the railway town of Changtu, and construct a railway for the exclusive use of the new colliery from Changtu station.

COAL WASHING AT FUSHUN.—The foundation work for the new coal washing equipment to be installed at Kuchengtzu mining office of which Mr. T. Onuma, in superintendent, is expected to be finished before winter, and the installation of the machinery will be taken up in April. The machinery has a capacity for washing 16,000 tons of coal in 16 hours. The coal will be improved in quality, but will not be raised in price according to the management which hopes to clear an extra profit by turning out more lump and medium-lump coal.

SPENDS MILLIONS: NO OIL.—After spending approximately Ps.3,000,000 in continued operations in search of oil deposits on Bondoc peninsula, Tayabas, the Richmond Petroleum company, through its local representative, C. T. Newcomb, has made formal announcement of its decision to discontinue drilling activities in the Philippine islands for the present at least. It is the company's intention to surrender all government and private lands and exploratory areas covering the territory now under lsaees and permits, he said. It is possible that further geological studies will be made of other parts of the islands. According to Mr. Newcomb, the Richmond Petroleum Company has drilled at Bondoc peninsula a total footage of 10,814. The Muguis No. One was drilled to a depth of 1,323-ft., Sapa No. One 3,757-ft., Pina No. One 5,117-ft., and Yebaan No. 1 617-ft. In gaining this footage slight indications of petroleum and natural gas were encountered, Newcomb declared, but nothing that even nearly approached oil of commercial quantity was found under the structures tested through the wells.

大正七年七月十日第三種郵便物認可

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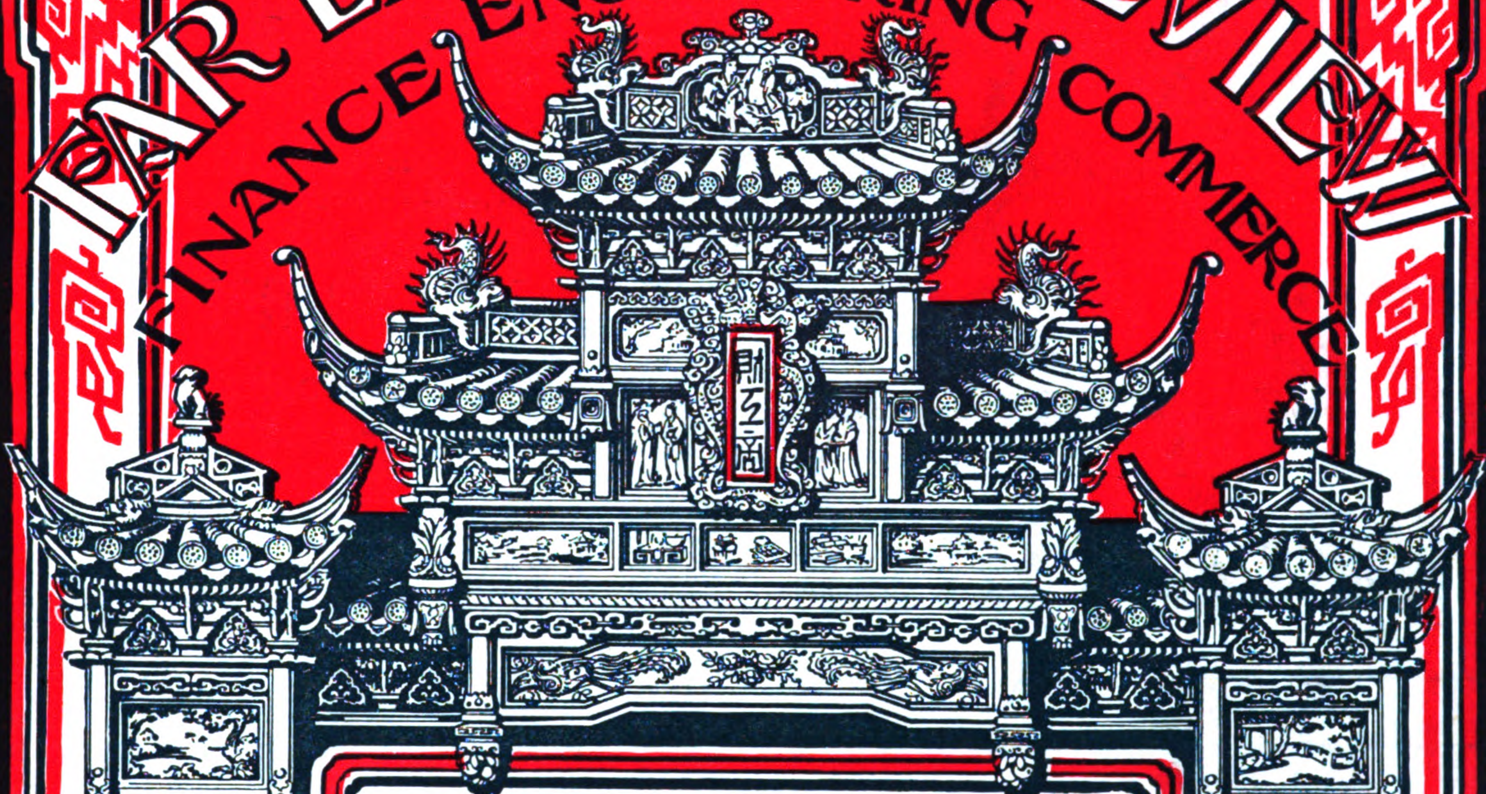
FINANCE ENGINEERING COMMERCE



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遠東時報

WHAT HAPPENED IN GENEVA

THE GREATEST CIVILIZING FORCE IN EASTERN ASIA
THE WORK OF THE S.M.R.
AMERICAN-JAPANESE CO-OPERATION
RAILWAYS AND TRAMWAYS IN KOREA
SUPER-POWER DEVELOPMENT
SIAMESE RAILWAYS WORKSHOPS
MINING PROGRESS IN N.E.I.
CHINESE TELEPHONE SYSTEM
JAPAN'S TELEPHONE RECONSTRUCTION
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Vol. XX | November, 1924 | No. 11

A.L.TAYLER.

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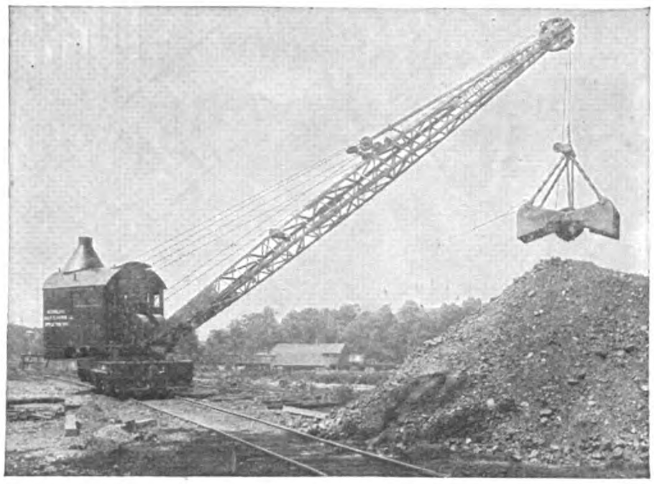

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XX SHANGHAI, NOVEMBER, 1924 No. 11

The Noose Around Japan's Neck

What Happened at Geneva?

AN EXPLANATION

WHAT really happened at Geneva? Briefly this: suppose nation A has a grievance against nation B and lays the matter before the world court. If the court rules that the question is purely B's domestic affair, nation A still has the privilege of appealing to the council of the league instead of accepting the decision of the world court as final and binding. As originally drafted, the league plan tended to support America's position based on the law of nations that domestic questions are not subject to international meddling. Under that plan a world court decision would tie Japan's hands and proclaim her the aggressor in the event of war. Japan proposed that any nation, league member or not, that refused arbitration or its findings should be judged the "aggressor," even where a reluctant nation held the issue to be one affecting its domestic welfare and sovereign rights. Then, if such a nation refused to accept arbitration, she will be declared the "aggressor" and the other nation could make war with the support of the league. The Japanese won their point and the appellant nation may now take the decision of the world court to the council of the league and pray for friendly intervention. If the other nation refuses to follow the court's decision it becomes the "aggressor." In keeping the record straight Japan nearly busted the league and for all practical purposes made it impossible for the United States to ever become a member state because of its irrevocable stand over the immigration question.

The press of America saw in all this a direct challenge, a menace of war, while many newspapers seized the occasion to advocate larger naval appropriations and to prepare for the hostilities they now seem to think inevitable. How they get that way, the Good Lord only knows.

There is another side to the Geneva incident, which as usual went over the heads of the good people assembled to straighten out the world's affairs and for the lack of a Far Eastern expert at the conference the American people were led to believe that Japan's attitude clearly presaged an intention whenever she is ready, to provoke a quarrel over racial equality.

To understand the other side of the incident it is essential to keep in mind that Japan does not and never has challenged the right of the United States to enact its own immigration laws or to say who shall or shall not enter the country as immigrants. Her grievance is that we handled the matter with an absolute disregard for the conventions. We insulted her and made her lose face, something that was carefully avoided by Great Britain in acquiescing in the exclusion of the Japanese from her over-seas dominions.

Japan, however, accepts the situation. More than all the nations of Europe she realizes the great strength which has elevated the United States to the status of a super-power. She knows that no one nation or combination of nations would dare to attack us. Her own future security and national prosperity depend so largely upon her trade with America, co-operation in the development of her industries and resources and mutual regard and friendship that under no conceivable circumstance would she jeopardize this by any foolish gesture of diplomacy.

However, there is one possibility that will cause Japan to fight. Let us once more recapitulate the conditions: America, Canada, New Zealand, Australia and British South Africa have definitely closed their doors to Asiatic immigration. Japan does not question their right to do this. America has followed this up by extending her Asiatic exclusion laws to an Asiatic dependency and enacted further laws which prohibit the Japanese from owning or leasing lands in the Philippines. Although this comes very close to her doors and bars her people from finding homes in a neighboring country, she is content to await the outcome of the independence movement. Some day the Philippines will open its doors to the Japanese. It will come naturally. Japan will not go to war to force this.

Russia, that is, Eastern Siberia, is practically closed to the Japanese. The Russians do not want them and place all manner of obstacles to their acquiring rights in that territory. Through the pressure of American diplomacy, Japan was compelled to withdraw from Siberia and forego the advantages that would have materially assisted her in coming to a proper understanding with Russia. This outlet is also closed for the present. There is an angle to this Siberian question little understood by Americans or Europeans. Japan is a fish-eating nation. She has no vast grazing lands upon which to raise a meat supply. The Sea of Japan, the Gulf of Tartary and the Okhotsk Sea with their littorals and connecting waters are to Japan what the prairies of the west and Canada are to America. Deprive her of the right to fish in these waters and the people of Japan starve. Yet even the fishing rights in Siberian waters are held by Japan under treaty with Russia, a treaty wrung from the latter by force of arms (the treaty of Portsmouth). The Soviet has done everything possible to cancel this treaty and place obstructions in the way of Japanese fishermen in the Okhotsk Sea, an attitude which at one time under Wilson seemed to receive the support of the American government. The fishing rights in Siberian waters are held by Russia as a purely domestic prerogative.

There is just one possible outlet for Japan's millions, one undeveloped store-house of essential raw materials and food supplies that will permit her people to live at home. This outlet lies in Manchuria and Mongolia, a right won by paying the price that every other fighting race has paid in the course of history for its expansion. Japan has over three billion yen invested in these territories in legitimate undertakings. Yet, she may not own or lease land therein. Her people cannot settle there and enjoy the fruits of their labors. The land laws of California and the Philippines find their exact counterpart in the laws of China. Furthermore, every now and then without any apparent reason, the Chinese central or provincial governments suddenly proclaim an embargo on the export of cereals. This same embargo may at any time be extended to other essential foods and raw products, all purely domestic affairs of China.

Even at this, Japan has accepted a situation that would cause any self-respecting white people to fight. Japan will solve her problem of over-population not by forcible expansion and the seizure of outside territory but by industrialization at home, and the development of food supplies and sources of raw materials within the empire and in those territories in which she has acquired certain rights by diplomacy and the force of her arms.

Japan presents the picture of a nation condemned to stand on its own feet in a water-tight compartment with no liberty of movement A slack noose is around her neck permitting a certain freedom in one direction only—in Manchuria and Mongolia Deprive her of this slight breathing room, destroy her possibility of maintaining life and expose her national security to attack from this quarter, and Japan goes under. The postponement of Philippine independence for another twenty-five years and the establishment of the British naval base at Singapore has drawn the noose tighter.

Let us now get back to Geneva. Some weeks before Japan threw the monkey wrench into the smoothly oiled machinery of this international debating society, the Chinese delegates announced their intention to bring before the league the question of the validity of the 1915 treaty which prolongs to 99 years Japan's lease to Kwantung and Fushun and extends her control over the South Manchuria Railway to a like period. This is the third time within two years that China has attempted to raise this issue, each time counting on American sympathy to carry her point. Japan has steadily refused to consider the question. With her it is a purely domestic affair.

Suppose that China brought her case before the court of nations and received a judgement that would place Japan in the position of an aggressor and bring down on her head the combined pressure of all the powers in the league to force her to get out of Manchuria. Consider this question in all its ramifications and bearings on the future of Japan and we will begin to realize something of what was in the mind of the Japanese delegates at Geneva. Japan will never go to war with America over immigration. She will, however, employ every diplomatic weapon possible to keep this question alive and before the world and by all peaceful measures endeavor to modify the American viewpoint.

On the other hand, Japan will fight if the noose around her neck is drawn any tighter. America knows this. So do the other powers who understand the situation. The Chinese delegates were preparing to throw the loose end of the rope over the roof tree of the Geneva conference room and invite the delegates to swing Japan into eternity. The performance was stayed by clever and rapid diplomacy. In saving herself, Japan, aided by American correspondents who knew nothing of Far Eastern affairs, focussed attention on the racial issue, and lined up the league against the United States. Incidentally, Japan put one over on China.

China has what she considers a good case against Japan. Japan has an equally good case against China. Any resurrection of this old question before a world court would have to go back of the 1915 treaties and the twenty-one demands to Portsmouth and still further back to the root cause of all modern Far Eastern troubles, the secret alliance between China and Russia of 1896. As it is, Japan stands pat on the accomplished fact, determined to oppose any outside interference in a matter which she considers as definitely settled. She has staked her existence twice on the plains of Manchuria and may have to do it again. Economically and strategically her national security still hinges largely on her position in this territory.

A purely domestic issue between nations is not confined to Japan's grievance over our immigration laws. There are, as we have pointed out, other more vital questions that affect Japan's position and which may compel her in self-defense to appeal to force in order to survive in the struggle for existence. As *The New York World* points out :

> "It is a proposal which touches bottom in the writing of international law, and the world will have no trouble remembering disputes arising out of 'purely domestic matters' which have spread far beyond domestic frontiers. Was it a 'domestic matter' for Serbia to punish the conspirators who assassinated the Archduke Ferdinand? Austria's insistence upon defining what constituted punishment and proper satisfaction served as a starting-point for the European war. Was it a 'domestic matter' for Spain to administer Cuba in any manner she saw fit? The United States did not think so in 1898. History is full of 'domestic matters' which boiled over the kettle and started war."

Might not the Cuban situation of 1898 be duplicated in China ? Under certain conditions it is easy enough to precipitate a situation through bad government or as a result of the present political chaos in this country that would vitally affect the very existence of Japan. These, however, are purely domestic affairs of China over which the league would have no jurisdiction. Would it be wrong for Japan to defend her existence against such a menace ?

Japan is right when she contends that there many purely domestic matters which have a direct bearing on international peace. The example of the United States in the racial question has been contagious, spreading to all Anglo-Saxon over-seas possessions and with every probability of its spreading to South America. Embargoes or the imposition of high export duties on food or raw materials are also the purely domestic concern of the individual nation, and in the case of a country situated like Japan might well convey its death-warrant if carried out by China supported by the civilized world bound together in a league of nations to enforce its laws. Japan's moral victory at Geneva carries no menace to America. It was simply the gesture of a people who invite the attention of the world to a situation that will have as great a bearing on future wars as racial discrimination.

The problems of peace are not centred in the settlement of Japan's disputes with America. The peace of the Far East is a matter in which America has only an academic interest. Japan intends to solve this problem in her own pacific manner and can accomplish her purpose only with the most carefully nutured international good-will, by vigorously stimulated tolerance, by steadily developed even-handed justice and by the elimination of national ego and overvaulting ambition. The peace of the Far East no longer depends upon the strict observance of the open door and other academic considerations. Peace, enduring peace, can be assured only when some humane consideration is given to those problems which confine Japan to work out her salvation within a water-tight compartment with a noose around her neck.

Far Eastern Contracts Placed in Britain

FAR Eastern contracts placed with British firms have recently been somewhat on the slim side, and the chief ones recorded during the past few weeks are noted hereunder.

Locomotives for Indian Railways

The Avonside engineering works of Fishponds, Bristol, have just received an important contract for 7 heavy tank locomotives for the Indian railways. These engines have been specially designed and are of a particularly robust construction, the line for which they are being built being 5 feet 6-inch gauge. The locomotives are fitted with Walschaert valve motion. That they are eminently adapted to the requirements of the line is testified to by the fact that the present order is an exact duplicate of one received by the same company some little time back for a similar number of engines.

Nizam's Guaranteed State Railways of India

Announcement is made of the placing of a contract with Beyer, Peacock & Co., Ltd. of Manchester (Eng.) for five 2-8-0-type superheated locomotives, while the Vulcan Foundry, Ltd., has also been successful in securing an order for two 4-6-0-type superheated locomotives, all of which are destined for use on the Nizam's guaranteed state railways of India.

East Indian Railway Places Buffer Order

An interesting contract has just been placed with the Sheffield firm of George Turton, Platts & Co., for 6,500 large complete buffers for use by the East Indian Railway Company. The buffers are to be constructed on the firm's new weldless forged steel principle.

Siamese Government Orders Gunboat

Sir W. G. Armstrong, Whitworth & Co., Ltd., of Newcastle-upon-Tyne, have recently received an order from the Siamese government, for the construction of an armoured gunboat for the local river service. The length of the vessel is to be 175 feet and it is to have a displacement of about 1,000 tons.

Wagon Contract Placed by Madras and Southern Mahratta Railway

An important contract has just been secured by the Metropolitan Carriage, Wagon, and Finance Company of Birmingham (Eng.) for 100 covered wagons and 100 open goods wagons. These are to be constructed specially to suit the broad gauge of the Madras and Southern Mahratta Railway Co.

Yokohama Gasworks Places Contract

The Power Gas Corporation of Stockton-on-Tees, has recently been commissioned to supply a complete gas coal retort generator plant for the Yokohama Gas Works.

The Greatest Civilizing Force in Eastern Asia

Japan's Heroic Efforts to Avert War by Developing Nearby Sources of Raw Material and Food for Her Rapidly Increasing Population

The Real Mission of the South Manchuria Railway

By Geo. Bronson Rea

FOREWARD:—Japan is now in the market for another large reconstruction loan, this time for Y.130,000,000 to enable the municipal government of Tokyo to carry through its share of the improvements. The Imperial Hotel, we are informed, is seeking a loan, the Kobe-Osaka Electric Railway has issued debentures in London, the city of Osaka will require financial assistance, the Korean railway companies are casting their eyes abroad as the only hope of obtaining the finances for carrying through their programs, while the South Manchuria Railway is embarking on schemes which will revolutionize the steel and oil industry of the Far East. Many other important schemes are held up for lack of funds. Behind all this activity, driving the Japanese unmercifully forward is the instinct of self-preservation, the heroic struggles of a peace-loving people desperately seeking a solution to the problems of existence through development of their own resources. The Japanese have been hard hit. The earthquake wiped out in a few hours the accumulated wealth of a generation of hard work. No war that Japan might have engaged in, could have inflicted such heavy monetary losses as the two days of horror which reduced their capital city and chief port to ashes. The calamity, however, did not stop the operation of nature's laws which is piling up annually a surplus population of 700,000 new children. They must live. To live they must work. They must be fed. America and Great Britain have closed their doors to the children of Nippon. They may not own or lease land in the Philippines. They may not settle in peace and own or lease lands in any part of China. The Russians will not have them in Siberia. They are now seeking an outlet in South America and even here Brazil is threatening to pass laws that will exclude them. A few thousand may find homes in Mexico. The problem, however, remains unsolved. Japan may fight for her right to exist. Placed in her position there is no doubt of what the Anglo-Saxon would do. Japan, however, realizes that such a desperate remedy will bring no permanent relief. She intends to work out her salvation at home by bringing all her waste lands under cultivation, by building railways that will facilitate their exploitation, by electrifying her water-powers and changing over from steam to electricity in operating her railways and industries, and in every other way possible creating new sources of wealth that will enable her to survive with a noose around her neck and the rope being hauled tighter by the jingoes of other countries who see in her magnificent efforts to save herself only the evidence that she is preparing for a war of aggression.

This is not Japanese propaganda. Few indeed are the men in Japan who realize the facts of a situation which is driving them pitilessly forward in a struggle to preserve their existence. Their deepest thinkers fail to grasp the significance of the forces operating to isolate them and compel them to live apart from the rest of the world in their own restricted habitat. There are, however, a few men in Japan who understand and these men have determined that the solution must come from within. They look to America for that sympathy and support which will enable them to surmount their difficulties. Recent events have convinced them that a full and friendly understanding between the two countries and a proper conception of the load under which they are staggering can come only through closer business relations. They are sincere. We are satisfied that once the American people fully realize what Japan is doing to preserve peace they will stand by her and relieve as far as possible any further tightening of the noose that their past mistaken diplomacy has placed around her neck. It is in this spirit that the following series of articles are written.

G. B. R.

WHILE the rest of China is passing through a state of political chaos, business depression and practical suspension of all new development work, it is refreshing to turn to the bailiwick of Marshal Chang Tso-lin and see the evidences of prosperity and progress brought to the three eastern provinces through the enterprise and initiative of the South Manchuria Railway Company, one of the few foreign controlled companies in China operating at a substantial profit. In the face of the most determined opposition and passive resistance on the part of the Chinese and the constant heckling of other powers, the Japanese in less than twenty years have converted this most backward of Chinese provinces into the most advanced and most prosperous. Their example has forced the Chinese into many lines of industrial activity and in many instances, this has taken the shape of joint Sino-Japanese companies, in which the nationals of both countries have subscribed to an equal share of the capital required. There are other instances where these undertakings have been made possible solely because the Japanese with their faith in the future of the country have provided the working funds in order to overcome the traditional Chinese opposition to foreign exploitation of their resources. The total amount of Japanese capital actually invested in Manchuria is roughly estimated at Y.3,000,000 of which one-half represents the investment value of the South Manchuria Railway and its properties. For the present, however, this confidence in China has not resulted in any appreciable profit, for outside of the S.M.R. the great majority of Japanese enterprises in Manchuria are being operated at a loss or at a profit far below the legitimate rate of interest allowed by the Japanese banks for fixed deposits. This is particularly so in the case of joint Sino-Japanese enterprises where the Chinese have contributed an equal share of the capital and enjoy corresponding equality in the appointment of directors and managers. In any fair analysis of Japan's investments in Manchuria it can be proven that far from exploiting the province, the Japanese have been the exploited. Millions have rolled into the pockets of Chinese officials for concessions that have never been worked, more millions have been invested in joint enterprises, in which the Chinese directors have made impossible the payment of dividends through overloading the payroll with relatives and salaried hangers-on. The Chinese in Manchuria, however, are prosperous; their officials are rich, Chang Tso-lin, its over-lord, has accumulated some $30,000,000 in cash and the provincial treasury shows an annual cash balance of considerably over $10,000,000. Much has been written about Japan's alleged exploitation of China. The other side of the story has never been told.

Manchuria, with its wonderful latent possibilities, is one of the few remaining lands of opportunity, a region in which despite all propaganda to the contrary, the principle of equal opportunity prevails for the trade and finance of all nations. That the province has gravitated under Japan's sphere of economic influence is due in part to the fact that its development has been made possible exclusively through Japanese initiative, the investment of Japanese

capital and to basic economic laws which no amount of political opposition can set aside. The fact that the territory is open for the trade of other nations is a constant reminder of the tremendous sacrifices of Japan incurred in driving out Russia after she had practically annexed and closed the province to foreign commerce. In restoring China's lost sovereignty over Manchuria, Japan provided evidence of her solicitude for the maintenance of China's integrity and a sincere desire to live on terms of amicable understanding with the nation from which she derived her culture and civilization. Manchuria to-day is an object lesson of what a public-spirited, well-organized and honestly directed corporation can accomplish in raising the living standards of the Chinese people at the same time improving their cultural status.

That Manchuria has been reclaimed from the poorest economical asset of China and elevated to its present enviable industrial position is due to the ceaseless activities and never-changing policy of the South Manchuria Railway Company which although coming under the technical classification of a commercial enterprise, is in reality the greatest civilizing force in the Far East to-day. This perhaps is a bold statement that may be challenged by those who believe that the American experiment in the Philippines is entitled to this distinction. The budget, expenditures and scope of the activities of the S.M.R. are three times greater even than the American administration in the Philippines and the ultimate working out of its mission will have a more far-reaching effect on the future of mankind than the widely advertised altruistic Philippine policy of the United States. In support of this statement it is only necessary to invite attention to the fact that last year the total revenues of the S.M.R. amounted to Y.185,000,000 as compared with the government of Korea's ordinary budget of Y.101,000,000, that of Formosa about Y.100,000,000 and that of the Philippines of Y.65,000,000. The revenues of Siam and Indo-China are about the same, Y.62,000,000 for the former and some sixty odd million for the latter. The only colonial government in the Far East which enjoys revenues exceeding those of the S.M.R. is that of the Dutch in Netherlands East Indies, where in 1923 the total recepits are estimated at 366,-000,000 guilders or roughly Y.300,000,000. The budget of the S.M.R. in addition to making up the annual deficit for the administration of the Kwantung leased territory which supports many schools and two colleges, also maintains all the schools in the railway zone (nearly 100) out of its appropriation of Y.10,000,000 for administrative expenses, a heavy and increasing burden entirely out of proportion to the railway receipts.

The fundamental policy guiding this tremendous civilizing and progressive force has remained unchanged through successive administrations, the main objective being to develop the resources of the territory served and create for China, Japan and the world at large a new storehouse of much needed raw materials, at the same time originating traffic for the railway. To accomplish this laudable end, the annual profits over a legitimate ten per cent. for the shareholders have been reinvested in establishing new industries and developing new sources of wealth. Important private Japanese interests have followed this example and invested further millions in establishing new industries not only within the railway zone but in joint partnerships with the Chinese in their own territory. At all times the policy of the S.M.R. has been to encourage the idea of Sino-Japanese co-operation and has liberally employed its surplus profits in setting an example for others to follow. In the early part of last year the number of these joint companies was 87, with a combined capital of Y.178,507,000.

This is a phase of Japan's activities in Manchuria little understood by those critics who view her every move with distrust. The Japanese may have, as these critics allege, exploited Manchuria, but such activities have been offset a hundredfold by the manner in which the Japanese have been exploited by the beneficiaries of their policy. The surplus profits of the S.M.R. added to the millions poured into the country by private Japanese investors have created the industries and developed the new sources of wealth which have made possible its present prosperity. For every dollar of direct profit taken out of Manchuria by the Japanese, ten dollars have found their way into Chinese pockets. Had the S.M.R. pursued a sordid money-making policy, piling up fat dividends for its shareholders, there might be some justification in the accusation that it was exploiting Manchuria for the benefit of Japan. Facts and figures, however, prove the contrary. Instead of the Japanese reaping legitimate rewards from their investments, the profits in the main have been distributed amongst the Chinese. Manchuria as a dividend-paying proposition for Japan is a fiction existing only in the imagination of her detractors.

In this respect Japan's mission in Manchuria resembles the philanthropic program of America in the Philippines and in other parts of China. While Americans contribute two dollars towards religious and cultural uplift work in China for every dollar they take out in legitimate trade profits, the Japanese have contributed fifty yen towards improving the material well-being of the Chinese in Manchuria for every yen returned on their investments. It is a matter of opinion which policy is doing the most to elevate the status of the Chinese. Both nations seem willing to wait for the future to bring its rewards, the difference being that the recipient of Japan's commercial altruism at least has the immediate satisfaction of possessing a fat pocket book and an overflowing rice bowl while America's beneficiaries are consoled by the hope that some day in the distant future they or their children will also be well fed and profitably employed. Ont he other hand, Japan's philanthrophy in Manchuria has brought hundreds of millions of dollars in orders to American manufacturers and we have no just cause to condemn a policy which has such a profitable bearing on our trade with this country.

As long as Japan adheres to her present program in Manchuria other countries will benefit enormously from the prosperity of the Chinese. Japan is and must always remain a creator of wealth, pushed forward by forces she may not resist without peril to her very existence. In this instance Japan has the satisfaction of having added to her near-by sources of raw materials and food supplies and of having consolidated her strategic position in the one quarter through which her national security was constantly menaced. Although much of the fruits of her labors have gone to swell the trade returns of other countries with China, Japan rests content with the indirect benefits that have accrued to her own commerce through the increased purchasing power of the Chinese and to the permanent improvements that are steadily increasing the volume of traffic over the S.M.R. and appreciating the value of its properties and other investments.

To quote the words of Mr. H. Porter, the British consul-general at Mukden, at a dinner recently tendered to Mr. Yasuhiro, president of the S.M.R. :

" It would be hard to find anywhere in the world an enterprise combining in itself so many and such varied activities, which, nicely handled and administered by the best brains Japan has at her service, has proved an object lesson in the art of communal development and the spread of modern civilization by railway . . . To have confined the enterprise into one of mere money-making would have been to lose one of the finest opportunities ever offered for far-reaching schemes of development which, while not immediately profitable, will in the long run not fail to justify themselves and the aims of their promotors."

In these words, the British consul-general at Mukden reveals something of the great change in the attitude of the foreign community in Manchuria towards the Japanese, a public testimonial to the great debt it owes to the spirit of fair-mindedness and consideration towards foreign interests which has always characterized the policy of the S.M.R. It is regrettable that such a public acknowledgement of the truth is not cordially endorsed by American opinion in China still influenced by a small anti-Japanese group which has arrogated to itself the right to speak on all occasions for national interests in this country. The British spirit of fair play so eloquently voiced in the above words, is a sign of changing conditions, a breaking away from the leading strings of narrow-minded and bigoted propagandists that is bearing fruit in increased orders for British materials and a corresponding decline in the volume of business with American manufacturers. That America is losing out in the competition with manufacturers of European engineering specialities in the equipment of new industrial establishments in Manchuria is traceable largely to anti-Japanese propaganda inspired by a group of Americans operating from Shanghai.

It is not the purpose of this article to describe in detail the many and varied activities of the S.M.R. as this would require a special volume. The urgent task which confronts Japan in developing this vast virgen territory as part of her pacific program to ward off the consequences of keeping her people at home and providing them with assured sources of raw materials and food is one that should merit the cordial sympathy and financial support

of other nations, especially of the one nation whose exclusion laws have driven the Japanese into this corner of the world to make their last stand for the right to exist.

Few people, even in Japan itself, have a full realization of the vital bearing on the future of Japan and world peace involved in the rapid economic development of Korea and Manchuria. Each year the menace to peace becomes intensified through the rising pressure of population in a country too small to hold it. As the halter around the neck of Japan is drawn tighter by the establishment of a huge British naval base at Singapore (now a certainty under the recent change of government in the country), by the prolongation of American rule in the Philippines, closing this natural outlet to her overflow and the stubborn resistance of the Chinese to leasing their lands in Manchuria or Mongolia for agricultural purposes, intensified by the reappearance of Russia in Northern Manchuria and Mongolia obsessed with its mission to dominate Asia, only the most strenuous efforts on the part of Japan and a corresponding recognition of her problems by other powers, can avert a catastrophe. The re-entrance of the Soviet in Northern Manchuria and its determination to make the situation more difficult for Japan is seen in the recent cancellation of the agreement entered into between the former management of the Chinese Eastern Railway and the South Manchuria Railway authorities through which products of northern Manchuria were routed for export via the port of Dairen. This measure is to be followed by a revival of the old working agreement between the C. E. R. and the Ussuri Railway to make Vladivostok the port for this region and a further freight agreement with some American steamship company that will have a monopoly of carrying the freight so diverted to foreign ports. This means a loss of nearly Yen 10.000,000 in freight receipts alone for the S. M. R. and the creation of a discriminating policy designed to injure the Japanese line and the value of Japanese investments.

If the present policies of the western powers are persisted in and there is an honorable desire to maintain peace, it can be attained only by aiding Japan to become self-contained. To accomplish anything along these lines, the necessities of life and the raw materials which will enable her people to work must be secured as rapidly as possible. Herein lies the importance of Manchuria and the great part played by the S.M.R. in working out the salvation of Japan and preserving world peace. Any attempt to interfere with or obstruct its program means a corresponding tightening of the rope around Japan's neck and the coming together of a heroic fighting people in one grand desperate struggle for self-preservation. On the other hand, the sympathy and support of other nations in carrying out the great task of redeeming the waste places of this region will do more to convince the Japanese of our friendship than anything else.

It is with the hope that this friendly co-operation will take the place of the present attitude of suspicion and opposition that we present in a superficial manner some new information about the many new engineering and development undertakings now being carried out under the auspices of the South Manchuria Railway and allied private Japanese concerns. A trip through Manchuria is an eye-opener to what might be accomplished in other parts of China under an efficient and honest government and competent industrial administration. From the moment the visitor steps ashore from the steamer at Dairen, he sees on all sides the many evidences of improvements that have already elevated Dairen to the rank of second port of China, and which bids fair as time goes on, to make it the premier port.

The first thing to attract one's attention is the handsome new landing pier with its commodious and comfortable passenger rooms and cargo handling appliances, equal if not superior to some of the more widely advertised accommodations of other ports. Facing this main pier is the handsome harbor office of steel and concrete built in a circular form and housing the many offices of the port authorities. A new addition or segment that will complete three-quarters of the building is now under erection. Down the wide streets one sees lines of electric tramcars loaded with beans and bean cakes destined for the wharves or for the many oil mills scattered around the town. This service of the Dairen tramways operated by the electricity department of the S.M.R. is of great benefit to the many manufacturing establishments of the port, transporting raw materials from the railway freight yards to the factories and the finished products to the wharves and railway. Some understanding of the importance of the manufacturing plants in Dairen are seen in the statistics which show that there are 42 factories of all kinds operating within the city limits capitalized at about Y.26,000,000, the majority of these being confined to extracting the oil from the millions of tons of soya beans transported by the railway from points further north. Scurrying around the wharves are seen several of the latest electric trucks handling cargo between the steamships and the warehouses while further away in the main railway yard the work of electrifying the freight lines is in progress.

At the coal wharf where the output of the great Fushun mines is loaded into steamers for export, the ground is being prepared for the installation of special car dumping equipment that will increase the loading capacity of the pier to 4,800 tons per hour. Work at the mines is being pushed forward to give an annual output of 8,000,000 tons, the bulk of which will be exported from Dairen. To handle this enormous tonnage the S.M.R. is considering plans for the construction of a special coal port in the vicinity of Dairen, but for the present is concentrating its activities in bringing the existing pier up to its fullest loading capacity. As a part of this huge mining, transport and shipping business, the S.M.R. intends to re-equip its lines with coal cars having a capacity of 60 tons each, in itself a big undertaking. These cars are to be dumped automatil cally at the wharf in connection with a loading device which wil- deliver the coal direct into the holds of the steamers awaiting cargo. All this wharf machinery and the shunting of trains in the terminal yard will be done with electric power, calling for a corresponding increase in the present (6,000 k.v.a.) No. 1 power house of the S.M.R. located in the terminal freight yards. The head of the electricity department of the company is now on an extended tour through America and Europe investigating new appliances applicable to this scheme. It has already been decided that the Dairen power station will be equipped with a Holbeck pulverized coal plant similar to the one now in operation at Fushun and another under course of erection at Anshan. This enables the S.M.R. to utilize, for its own purposes, its dust coal from the Fushun mines for which there is no market. Expert reports on the Fushun pulverized coal plant indicate that it is the most efficient installation of its kind in the world.

On the No. 2 wharf at Dairen the S.M.R. has just completed the erection of a cold storage plant supplied by a Danish manufacturer, the first step in the development of another great industry designed to supply Japan with fresh meats from Manchuria and Mongolia. The working out of this program will call for the building of complete trains of refrigerator cars, subsidiary cold-storage stations at the various receiving points, the installation of cold-storage facilities aboard the Japanese steamers engaged in the trade and the erection or expansion of cold-storage plants in Japan. The rapid development of this industry depends in large part on the preservation of law and order in the Mongolian border lands enabling the Mongol herdsmen to raise their cattle and sheep without fear of Hunghutze raids or the more destructive imposition of illegal taxes. Japan is turning more and more to the consumption of beef, wheat and other western foods, and with the completion of a chain of cold-storage plants and transportation facilities that will land the meat in Japan in proper condition, a profitable market will be created for the Manchurian and Mongol cattle men. The new cold-storage plant on Pier No. 2 at Dairen and the construction of special refrigerator cars for the S.M.R. marks the first steps in the development of this industry.

It is well to digress from the main theme of this article for the moment in order to emphasize the really herculean efforts Japan is making not only at home but in Korea and Manchuria to solve her population problems in a peaceful manner by developing a food supply that will help to make the empire self-contained. It is not altogether sordid commercialism or aggressive political designs concealed behind peaceful penetration as some people believe which urges Japan forward in her plans to develop Manchuria. She is not so much concerned with the principles of the "open door" in that territory as she is to diminish as far possible the greater danger to international peace that may arise from her rapidly mounting population which has no outlet and no hope of sustaining life without an independent source of food supply. It will come, therefore, as a great surprise to the outside world to learn that the S.M.R. through its agricultural experiment station at Kungchiling has succeeded in cultivating rice on a large scale in a territory which before the advent of the Japanese was given over entirely to the growing of millet, the staple food of man and beast in these regions from time immemorial. Every attempt on

the part of the Chinese to grow their favorite article of food in this cold northern climate had failed.

It did not take long for the S.M.R. agricultural station to demonstrate that rice could be profitably cultivated even in Manchuria. The Chinese, as usual, scoffed at the idea. At first, the Japanese confined their cultivation to plots located within the railway zone under their own jurisdiction. It was not long before the incredulous Chinese began to sit up and take notice. Encouraged by the Japanese, the Chinese then began to plant rice in the river-bottoms in the immediate vicinity of the railway zone and little by little as success attended their efforts, extended the area by digging irrigation canals. The results are seen in the figures. The first rice crop some years ago, was about 100,000 *koku*; last year the harvest was nearly 1,500,000 *koku* and the area under cultivation is constantly being augmented.

The prospects of a heavy cultivation of rice in Inner Mongolia along the upper reaches of the Liao River are extremely promising. One of the tributaries of the Liao (the Chingshui) has an irrigable area of over 17,000,000 *tsubo* and it is in this district that Baron Okura has established a joint enterprise with the Chinese for the cultivation of rice. Because of the singular adaptability of the Chinese to supervise this particular branch of agriculture, a typical illustration of the profitable nature of the enterprise is reported where an investment of Y.5,000 brought in a crop valued at Y.35,000. The only barrier to the successful reclamation of these vast areas of waste land is the provincial law which prohibits the leasing of land to foreigners. Needless to say that although there is no discrimination, the law was specifically aimed at the Japanese, the only people interested in bringing the lands under cultivation. The situation is almost identical with that in the Philippines, where millions of acres of public land lies idle while laws have been enacted to prohibit the Japanese from purchasing or leasing them. The operation of these various land laws in near-by countries is forcing the Japanese to concentrate more and more on the development of their own narrow margin of waste lands within the empire and unless there is a solution that will enable them to have an equal chance in the struggle for existence, the result can be better imagined than depicted.

The success attending Japanese agricultural activities in Manchuria is an eloquent tribute to that same enterprise and initiative which developed in fifteen years the obscure local soya bean trade to its present magnificent international proportions. The development of the rice industry in Manchuria goes hand in hand with the development of the cattle and wheat industry, all basic essentials to Japan's ability to solve her population problem by keeping her people at home and feeding them. After closing the door to the Japanese in the United States and in the Philippines, forcing them to work out their own salvation in their own way without encroaching on the sovereign rights of China, it would seem that the American people might well stand behind the Japanese financially in order that they may succeed in their peaceful efforts to survive.

Coming back to Dairen and the work of the S.M.R., it would require a special volume to describe adequately and in detail the construction program that is now being carried out for the expansion of the city and port. New blocks of residences, clean, home-like villas with all modern improvements are springing up on all sides. Building societies are following the system in vogue in the United States of buying a few squares of land, improving it, erecting homes and selling them to individuals on the installment plan, in which they are financed by the banks and the special Japanese institutions organized for such purposes. New streets are being built, sewers and water mains laid, tramway facilities extended, automatic telephones have superceded the old system, while schools, hospitals and other public edifices are seen on all sides. The tendency is to build the residential section of the city several kilometres away at Star Beach, where already the directors of the S.M.R. and many prominent business men have erected handsome villas for permanent residence. Within ten years, the whole Hoshigaura district will be transformed. The golf links will be removed to another location and this particularly choice area will become the preferred residential section. On the program is also the erection of a much larger seaside hotel in order to accommodate hundreds of guests from all parts of China, now annually turned away for lack of rooms.

The Dairen hospital of the S.M.R. when completed, will rank as the largest and best equipped in Asia, rivalling in the completeness of its fittings the Rockefeller Institute at Peking. This building was fully described in the January, 1924 number of THE FAR EASTERN REVIEW. It is regrettable to learn that due to the mounting costs of this magnificent edifice (that seems to come under the head of unforeseen extras in the original contract) the S.M.R. authorities have recently cancelled the contract with the Geo. A. Fuller Company of the Orient and suspended further work.

In its immediate building program, the S.M.R. has included the erection of a magnificent terminal railway station that will also house the operating departments of the railway, now quartered at the head office. The site for this station is to be alongside the present old wooden structure, just beyond the Nippon Bridge. Another new hotel is to be erected at Mukden superceding the present Yamato hotel on the second floor of the railway station. The cost of this edifice is estimated at Y.1,300,000 and prizes were recently awarded for the best plans submitted. Work, however, will not be commenced before 1925 while the erection of the new terminal station at Dairen will be postponed until other more essential industrial undertakings have been financed.

One of the most interesting features of the S.M.R.'s building program is the reconstruction of the entire colliery town of Fushun. The old Chinese city, offices of the company and the Japanese residential town are located in a direct line with the open cut work on the main coal seam and at the rate stripping the top soil is now progressing, it will become necessary, in a few years, to raze the old town to make room for further mining operations. The edge of the new open cut is now about a half mile from the town limits. In anticipation of this difficulty, the S.M.R. authorities some time ago selected a new site far removed from any present or future coal mining operations, located on the hills overlooking the Hun River. Here, a new town was laid out with wide streets, a spacious park and several playgrounds, sewer, water and central heating systems and other essential public utilities. Over one hundred new residences and apartments for the staff and workers have already been erected. These villas for the employees are probably the finest of their kind to be found in China, reminding the visitor of the southern California type of architecture. Outwardly, these houses follow the very best style of western architecture, though the interiors are designed to conform to the Japanese idea of comfort.

The S.M.R. authorities explain their lavishness in this matter of housing by the simple fact that it is the only way they can induce departmental heads, engineers, clerks and skilled workmen to leave their homes in Japan and settle down permanently in Manchuria. In order to get good men on the job and keep them contented it is necessary to provide good houses, the best of schools for their children, clubs, recreation grounds, libraries and the other cultural facilities that tend to make life agreeable in a foreign country. In other words, the S.M.R. finds it as difficult in Manchuria to engage and retain the services of good men as Americans have found it in the Philippines. There is no ulterior motive in expending funds for what in China might otherwise be classed as luxuries. It is simply the only policy that will attract and keep the best men on the job. American firms in Shanghai have faced the same problem and had to provide the funds out of their own pockets for erection of schools, clubs and churches in order to keep their employees satisfied.

In building this new colliery town, the S.M.R. is concerned only with properly housing and providing for the comforts of its own employees, leaving plenty of ground for the erection of private dwellings, stores, hotels, banks and other commercial edifices. Land for this purpose is leased by the S.M.R. to merchants and others attracted to the town because of its assured prosperity. In this connection, the Bank of Chosen and the Oriental Development Company are advancing building funds on the condition that the program of the S.M.R. is not modified or the complete removal of the old town unduly postponed.

For the water supply of the new town the S.M.R. has just completed at a cost of a million yen the installation of a water works, capable of supplying 400,000 cubic feet of sterilized and filtered water for house consumption and 200,000 cubic feet direct from the main reservoir for the use of the power houses. The Patterson system of filtering is used. A pumping station elevates the water to a reservoir for the supply of the higher levels. Another important public utility is the central steam heating plant connected by street piping with all the company's houses in the new residential district. This plant, the largest of its kind in China, is to be still further enlarged when the building program warrants it.

Having jumped from Dairen to Fushun it may be just as well to add a few more remarks about the development work now in progress at this place. The main features of the Fushun mines, their pits, sulphate of ammonia plant, Mond-gas producer and power house, and other technical details have all been published in past numbers of THE FAR EASTERN REVIEW and new developmnts will be fully described in future numbers. We only wish to touch on a few of the present improvements and give some idea of the progress being made. In the first place the Fushun Coal Mines are misnamed. Properly speaking, Fushun is a gold mine, with an inexhaustible supply of cheaply mined coal that will stand a century of extraction before the operation becomes unprofitable under present mining methods. The main coal seam 80 to 480 feet thick extending for several miles, dips at a slight angle towards the river from the outcrop on the Hun river hills and is easily mined by stripping off the top soil. This top-soil (40 feet thick) consists in the main of a strata of oil-bearing shale containing an average of seven per cent. crude oil, sufficient to supply 1,500,000 tons of oil annually for two centuries. An initial dry distillation plant that will produce 50,000 tons of oil annually is to be erected next year at a cost of Y.7,000,000 and the plans provide for its expansion to a point where it will free Japan from foreign oil importations. An article on this development appeared in the October number of THE FAR EASTERN REVIEW. The next few years will probably witness the investment of Y.50,000,000 in this enterprise alone, without counting the expenditure for tank cars, storage tanks at Fushun and Dairen and the use of tank steamers to convey the product to storage tanks in Japan. The development of this one industry and its by-products may well call for the investment of Y.100,000,000 in providing for all its ramifications.

Up to the present, the coal from the open cut mine has been screened and classified by hand, but a contract has been placed in Germany for a new Rheolaveur system coal-washing and dressing plant to be erected at the head of the cable incline which hoists the loaded cars from the open pit to the ground levels. This will enable the S.M.R. to better classify its coal for the market and save the screenings and dust for its own use in the pulverised coal installations it proposes to erect in all its main power plants.

The first of these pulverized coal plants, manufactured by the Holbeck Engineering Company of Cleveland, is now in successful operation at the No. 3 power house at Fushun which furnishes current for the long-distance power transmission line to Mukden and Liaoyang. This pulverized coal plant is being duplicated at the power house attached to the Anshan Iron and Steel Works and another is to be erected in connection with the power house at Dairen. Experiments in burning pulverized coal on the Formosan government railways have been carefully followed by the S.M.R. authorities and one of the possibilities of the future is the adaptation of all their locomotives to this type of fuel. The perfection of this system of utilizing the dust from their own mines will enable the S.M.R. to market their best qualities of coal and utilize profitably a product which now has no commercial value.

In this, as in many other technical matters, the S.M.R. has been the most active agent in opening up a market in China for the most advanced types of engineering installations, in which American manufacturers have, in the past, profited to a greater extent than their European competitors. This quasi monopoly is, however, being gradually displaced by a wider use of European machinery and in many of the new installations the S.M.R. has gone to Germany for equipment while British manufacturers will probably obtain the contract for the oil shale distillation plant.

At some distance from the main coal workings located along the main electric railway serving the entire colliery, is a group of new buildings erected during the war by the Kuhara interests as a zinc smelter and refinery, the ore being imported from South Amercia. The sudden ending of the war caused this fine new plant to suspend operations and finally to close down. The buildings, however, of first class construction, with their power house and chimneys still stand and have been acquired by the Suzuki interests of Kobe who will refit and remodel them as a steel works. The Suzuki company owns and operates the Kobe Steel Works and will ship a part of this equipment to Fushun and engage in the manufacture of steel from iron supplied by the S.M.R. blast furnaces at Anshan. In addition, the S.M.R. will furnish coal and electric power at reduced rates and purchase the bulk of the steel output which for some time, we understand, will be confined to castings and minor products. As it is the intention of the S.M.R. to later on engage in the manufacture of steel on a large scale at Anshan, the Fushun works will undoubtedly be confined to turning out the more complicated castings for machinery and railway equipment parts.

The development of the Fushun coal mining lease to a point where 10,000,000 tons of coal and 500,000 tons of oil will be annually produced is the pivotal point in the S.M.R.'s plans for the development of Manchuria, as it is from this golconda that the real profits will be derived that will enable the other undertakings to be financed. Of equal importance, however, to the future of Japan and prosperity of China is the plan now under way to restore the Anshan iron mines and blast furnaces to a profitable working basis. The Anshan iron belt is estimated to hold over 300,000,000 tons of ore but this estimate is subject to considerable revision upwards or downwards after proper exploration. During the war the S.M.R. erected at this point two blast furnaces for supplying iron ore to Japan and during the period of high prices was enabled to work at a fair profit by utilizing only the higher grades of ore found in very limited quantity, the deposits being in the main of low grade non-magnetic ores averaging 40 per cent. of iron content. Last year the S.M.R. brought out a commission of American mining experts, who, after most elaborate studies on the ground submitted their report recommending amongst other things the installation of a concentrating plant and other details which would in their opinion permit of the economical mining and handling of the ore preparatory to its being fed into the blast furnaces.

Supplementing this very complete report, the S.M.R. expert and engineer at the Anshan mines (Mr. T. Umene) conducted a series of independent experiments extending over a period of three years with the gratifying result that he has perfected a furnace that will roast the hemitite ores and reduce them to sixty per cent. magnetite. Without enlarging at this time on the technical features of this process it is sufficient to state that the latest type of furnace evolved as the result of Mr. Umene's experiments has conclusively proven that the low grade hemitite ores can be treated economically in large quantities thus making possible the immediate exploitation of these deposits and the profitable operation of the blast furnaces. An experimental furnace of 300 tons per day capacity has been in successful operation under the watchful care of its inventor for some months and the results obtained are so satisfactory and convincing that the S.M.R. authorities have decided to erect a battery of ten of these furnaces that will give an output of 3,000 tons of reduced ore per day or roughly 1,000,000 tons per year. The preliminary work of preparing the site for this innovation in connection with the concentration plant is now in progress, covering the entire side of a hill situated in the centre of the properties.

The battery of reduction furnaces will feed the roasted ore into the supply bins that will in turn feed a concentrating plant of equal daily capacity to be erected on the opposite declivity of the same hill in order to provide the proper gravity flow from the crushers to the sintering machines. The plans for this concentrating plant with its crushers, rolls, ball mills, classifiers, magnetic separators, pulverizers and sintering machines have all been prepared and experts are now abroad submitting reports as to the best types of machinery to be purchased. The cost of the plant will approximate Y.10,000,000. In the meantime a small experimental concentrating plant has been erected and in use for some time in order to demonstrate in actual practice that the system will succeed. This experimental plant alone cost about Y.1,000,000.

Side by side with this development goes the further expenditures for developing the widely scattered Anshan iron deposits. This covers a wide range of engineering, including the construction of miles of standard gauge railway, light railway, mine cars, diamond drilling outfits for exploration work, air compressors, drill steel, machine shops, steam shovels and excavators, new water supply and the other details which go to make up the complete equipment of a modern mining enterprise. If pig iron can be produced within the present estimates the S.M.R. authorities will leave this problem behind them as a finished job and begin the erection of a steel works and rolling mill whose capacity will depend upon the requirements of the market. It is not difficult to look ahead and foresee the day in the not distant future when the industrial requirements of Manchuria, Eastern Siberia and other parts of China will be able to consume the major part of the output of such a plant. At all events the S.M.R. authorities are once more hopeful and face the future with a greater degree of security now that the problem of what to do with their Anshan properties has been so happily solved.

Ties that Bind

A Wide Field for Profitable Co-operation with Japan

THE report comes from New York that interests representing the Imperial Hotel of Tokyo have approached bankers there concerning the prospects of obtaining a loan of approximately $3,500,000. The possibilities surrounding such a loan created considerable comment in financial circles as such a credit would be unique in that it would be the first of its sort ever floated in New York. Bond houses emphasized the possible risk in floating an issue secured by real estate in a country subjected to earthquakes to which the representatives of the Imperial Hotel answered that the hotel was of special construction designed to withstand seismic disturbances and was fully tested in the great quake of last year. The proceeds of the desired loan will be employed to refund an obligation of $2,000,000 now outstanding and the remainder to enlarge the hotel's capacity from 265 to 1,000 rooms.

Backing American Methods

There would seem to be every good reason why such a loan should not only be profitable but sound business on the part of American investors. In the first place it will show that we have confidence in our own methods of construction and encourage the Japanese in their present tendency to adopt American standards. The Imperial Hotel stood well the terrible test of September 1 of last year and those who lived within its walls through the subsequent severe shakes and almost continuous tremors have confidence that the building is the safest place in Tokyo during an earthquake. The Imperial Hotel enjoys the distinction of being the only home for foreigners in the capital. It is always full and in the tourist season people are turned away. For many years it will retain its place as the premier hotel of Japan.

The failure of such a loan at this juncture would have far reaching consequences on the future of American building methods in a country passing through the process of reconstructing itself along modern lines. Aside altogether from the reconstruction of Tokyo, the pressure of population in Japanese cities is compelling a revolution in building methods and whereas in the past Japanese houses were strung out horizontally, present conditions demand that they be built as far as possible of several stories. Needless to state if Japan is to extend vertically, the houses in the main will be of earthquake-proof steel and concrete construction and the Japanese will turn to that country for materials that has demonstrated its superiority in this class of construction. To reject the opportunity of backing our methods with a loan is to send the Japanese elsewhere for their structural materials and building specialties.

Transformation of Osaka

It is not alone in Tokyo and Yokohama that reconstruction is taking place. There are other large cities of Japan undergoing a transformation forced upon them by the march of progress and the pressure of increasing population, Osaka, the industrial centre of Japan, is a case in point. By the incorporation of adjacent villages and towns, the city of Osaka will have an area of sixty five square miles, more than double that of Tokyo and a population of 2,000,000, fifty per cent. larger than that of the capital city. Greater Osaka will then become the greatest city in the empire. As a matter of fact Tokyo is no longer the wealthiest city of Japan that distinction having passed to Osaka. Before September of last year, Tokyo's wealth was estimated at Y.8,530,000,000, of which seventy per cent. was wiped out during the earthquake. Osaka's wealth is placed at Y.4,712,650 which places it at the head of a list of 97 municipalities. However, Tokyo's power of recuperation is seen in figures which show that in the past year it has advanced 20 per cent., which makes its present wealth about Y.3,400,000,000. For the moment, Osaka has the advantage and its merchants and municipal authorities are seeking to maintain this lead by extending the municipal limits.

The reconstruction of Osaka has been going on for some years and many new steel and concrete office buildings, warehouses and factories break the sky-line of the old one-storied Japanese city. The expansion of the original municipality into a Greater-Osaka has brought with it a corresponding extension and enlargement of public utilities. Sewers, water supply, lighting, roads, transportation, harbor facilities, sanitation, schools, parks, playgrounds and other improvements that accompany the growth of a modern city have been planned and are being built as fast as funds are provided. At the present moment, the citizens of Osaka, despairing of receiving any assistance from the imperial government for carrying out these improvements, are making up their minds to bear the expense themselves. This will probably send the municipal authorities out into the money markets of the world to obtain in part the funds that will enable their plans for a greater Osaka to be pushed forward. In such a case, the country which advances the funds, will benefit in the supply of materials.

New Building Scheme for Tokyo

A new scheme for the reconstruction of Tokyo has been advanced by the new mayor (Mr. Zeko Nakamura), who proposes the creation of a private concern to be called the Tokyo Reconstruction Building Company capitalized at Y.20,000,000, one-quarter of which is to be paid up, and the remaining Y.15,000,000 to be subscribed within five years, the company to receive funds amounting to Y.100,000,000 from the government in five year installments at the annual interest rate of 6 per cent. The fund is left unredeemed for five years and after that it is to be refunded to the government in 15 years. The company subsidizes 60 per cent. of the total expenses required for the construction of fire-proof buildings with a total area of 800,000 *tsubo* in the fire-proof zone at Marunouchi. While the government supports the plan in principle, the municipal plan solely aims at subsidizing the construction of fire-proof buildings in Marunouchi and does not take into consideration the Y.7,000,000 which the government intends to advance to the Tokyo municipality for a commercial and industrial fund at a low interest rate.

Under the circumstances, the plan has so far failed to enlist the government sanction, but Mr. Nakamura intends to remodel it so as to suit the plans of the government authorities. Anyhow, it is practically decided that the reconstruction of the capital will be undertaken by a private corporation to be organized with municipal support, instead of being carried out directly by the Tokyo municipality.

Loan for Tokyo Harbor

Added to this important work is the scheme for the construction of a proper harbor at Tokyo, some details of which were published in the September number of THE FAR EASTERN REVIEW. The Tokyo harbor scheme calls for the reclamation of 1,829,000 *tsubo*, of which 1,093,000 *tsubo* will be salable land that will be used as security for raising the loans required to finance the work. The amount to be raised by the city of Tokyo for this purpose is placed at Y.34,562,000 secured on the value of the reclaimed area, estimated at Y.65,580,000. According to the new program for the construction of the port, work will be started next April and extend over a period of seven years. The estimated cost is Y.35,000,000, or about Y.5,000,000 a year. The funds are to be provided by the municipality from its regular revenues, from loans, government subsidy and the proceeds from the sale of reclaimed land. Of the total area to be reclaimed (1,829,000 *tsubo*), 136,000 *tsubo* is included in the port site 600,000 *tsubo* for roads and other public uses, leaving the balance, as mentioned above, to be sold.

Amortization of the loans raised will be commenced in 1932 and completed in 1941, the total sum being Y.91,251,648, including the capital and interest to be paid. The total funds in round numbers required for the work are as follows : Municipal expendi-

tures, Y.778,000; government subsidy, Y.11,660,000: Loans, Y.34,562,000: Sale of reclaimed lands, Y.65,580,000: Total Y.112,-587,000. By the end of the fiscal year 1941, the municipality is expected to have a balance to its credit over and above the cost of the work of Y.21,335,911.

Industrial City of Tsurumi

Another equally important engineering undertaking held up for lack of ready capital is one bearing a close relation to the development of the Tokyo and Yokohama districts, involving the reclamation of enormous stretches of land between Tsurumi and Yokohama for the creation of a new industrial town site. This work has been in steady progress for some years and many large factories have already been erected on the reclaimed land. These include such important plants as those of the Asahi Glass Company. The Asano Shipbuilding Works, The Shibaura Engineering Works, the Nippon Oil Company, the Nippon Steel Pipe Company, the Mitsui Bussan Kaisha, the Rising Sun and Standard Oil installations and the Nisshin Flour Mills.

This great work which is connected with the plans for the improvements of the ports of Yokohama and Tokyo and the construction of the Tokyo-Yokohama canal, is an Asano undertaking incorporated as the Tsurumi Reclamation Company, Ltd. The reclaimed area will cover one million five hundred thousand *tsubo* (approximately 1,225 acres). Five dredges are constantly at work employing sand pumps which distribute the dredged material from the bottom of the bay to the reclaimed area. This development scheme is self-contained, having its own hydro-electric plant at Ochiai Mura with a maximum capacity of 3,500 k.w. for the needs of the industrial plants, supplemented by a contract with the Tone Hydro-Electric Company to furnish 50,000 h.p. to meet the full power demands of the area. In addition, the district is to have its own railway system operated by the Tsurumi Harbor Railway Company chartered last April.

American-Japanese Match Combine

Another recent phase of American-Japanese co-operation is the signing of a contract on October 18 between the Nippon Match Company and the International Match Corporation of Delaware in which the American company purchased stock to the value of Y.250,-000 in the Japanese concern and has underwritten its debentures to the amount of Y.900,000 to be floated in the United States. The present capital of the Nippon Match Company is Y.1,000,000 and the new contract raises it to Y.1,250,000, apart from the debentures. The International Match Corporation is a Swiss company operating with Swiss, British and American capital and registered under the laws of Delaware. It is capitalized at $50,000,-000, one of the strongest match combines in the world. This transaction marks one more step in American-Japanese co-operation, in line with similar combinations like the Mitsui-General Electric, Mitsubishi-Westinghouse, Western-Nippon Electric, Matsukata,-Roosevelt, Truscon Steel and other enterprises which link together the best interests of the two countries in an industrial alliance which will contribute more towards the permanence of peace and good-will than all the treaties and protocols of the diplomats.

Korean Hydro-Electric Field

Another article in this number of THE FAR EASTERN REVIEW on the development of Korean railways, indicates that American capital is also investigating the inducements for profitable investment held out in this country. The Korean authorities, keenly anxious to contribute their part to make the empire self-sustaining are conducting investigations that will open up their undeveloped lands to colonization and agriculture. One of the most promising fields for investment undoubtedly lies in the development and exploitation of its many water powers. A hydro-electric bureau under the department of communications is now making an exhaustive study of the power possibilities while a start has already been made in developing and utilizing the water power of the Kongo-san district. These investigations were carried on in a desultory sort of way for several years with fairly good results and in 1922 the government appropriated Y.240,000 for the establishment of a special bureau whose activities however have been somewhat crippled this year by the retrenchment program which has cut down its appropriation to Y.22,000. However, it fairly covered the ground in the two years it was able to work unhampered by lack of funds, and by last March had completed investigations of 26 power sites capable of producing 392,474 h.p. out of the 130 places where power is available.

In addition to this work, it is carrying on investigations at over thirty places along the principal rivers to ascertain the volume and head of water at these points. One of the most interesting features of the work of this bureau which has attracted attention in America and Europe is the investigation being made for the purpose of utilizing the 30-foot rise and fall of the tide at Chemulpo for the generation of electricity. The scheme is pronounced by experts to be economically feasible. It may be some years before the Korean water resources are drawn upon for industrial purposes, but if the creation of new industrial plants continues at the present rate, it will not be long before Korea's water resources will be harnessed and made to fulfill their part in the struggle for existence that faces Japan.

Japan's Coal-tar Chemical Industry

(Continued from page 543.)

and the evolving of new uses. The difficulty is that the most of these products are truly by-products of the very profitable industries, and consequently they are not conserved, developed, or pushed as a major product would be. The appellation "by-product" is a misnomer and should be abolished. Coal distillates should be a major product in every coal-consuming industry.

VALUE OF IMPORTS OF COAL-TAR PRODUCTS

[Figures represent thousands of yen]

Classes	1922 Total	1922 United States	1921 Total	1921 United States	1920 Total	1920 United States	1919 Total	1919 United States
Carbolic acid	854	18	862	407	3,634	1,501	4,337	2,381
Aniline oil	359	...	277	246	...	...	...	...
Aniline salt	299	12	88	15	489	464	41	6
Aniline dyes	12,965	1,688	13,004	1,783	14,895	10,113	10,629	8,041
Indigo, artificial ...	5,226	...	7,008	657	2,471	835	776	198
Other coal-tar dyes ...	687	7	460	30	547	138	91	84
All other chemical products derived from coal-tar distillates ...	1,148	45	953	351	...	...	...	...
Total	21,538	1,770	22,652	3,489	22,036	13,051	15,874	10,710

Note.—Japanese figures as to the participation of the United States in the trade of 1922 are not available: hence, for comparison, the export figures of United States trade with Japan as recorded in Foreign Commerce and Navigation of the United States have been used whenever classification was specific and such statistics were considered comparable.

The Soviet financial department is making its interest in the timber business very clear as a budget factor, and recently held a conference to gauge the future of the timber industry and what it may do even for the budget of the current year, not omitting the question of concessions. It was agreed that the concession holders should be required to submit to the department a statement of their financial and production programs so that the felling tax could be made a reliable basis. European Russian exports are not expected to exceed the total of the preceding year, but in the Far East the prospects are better and it is expected that the exports will show a considerable advance.

Apart from raw timber, it is interesting to learn that the production of bent wood furniture is about to begin on a serious scale in Russia. This industry had practically died out, or, to be exact, down to .5 per cent. of pre-war. The automatic extraterritorialization of many of the bent wood factories by the provisions of the peace treaties accounts largely for the practical decrease of this business as a Russian one, the bulk of the business going to Poland.

The plywood industry makes solid progress and the 9691 cubic meters made in the first half of the year would have been considerably more if the raw material had been available. The Trust is in possession of considerable orders from abroad and will execute them. The factories will be overhauled where necessary and ten factories will be at work from July 1, so we look for a large export of this item, which is one of Russia's pet industries.—*The Timberman.*

Railways and Tramways of Korea

A Profitable Field for American Capital

The Government's Program Calls for Building Nearly 4,000 Miles of State Railways to Which is Added Another Thousand Miles of Private Railways

THE success attending the flotation in New York of the $10,000,000 loan to the Oriental Development Company for its enterprises in Korea, has attracted the attention of American bankers to the possibilities of that country as an investment field and it is reported that a special investigation is now being conducted in connection with the further development of private railways in that country by American capital. The excellent work of the Oriental Development Company in afforestration, reclamation, irrigation and development of agriculture in various parts of Korea is closely allied with the growth of transportation facilities and there is reason to believe that the American banking group which issued the previous loan may interest itself further in furnishing the funds for railway construction.

Korea enjoys a unique position amongst the countries of Eastern Asia, appealing strongly to the banker as a safe field for profitable investment because of the guarantees of law, order and stability in the country since it was annexed as part of the Japanese empire. With a population of 18,000,000 hardworking and peace-loving people, doubling their numbers in about thirty years, the development of the national resources becomes a problem of the first magnitude. When this is supplemented by the pressure of the population on the food supply in Japan proper, the necessity of bringing every available acre of agricultural land in the empire under cultivation is one of the most important questions that confronts the cabinet at Tokyo.

Up to a few years ago, strategic considerations played the most important part in the construction of the main Korean trunk lines. The war with Russia forced the completion of the through north and south trunk line and during the years which followed when Russia was building the Amur line and making herculean efforts to get into a position to resume the conflict, the Japanese government was faced with the burdensome task of rushing forward the construction of essential railways in Korea as part of its main line of defense. As soon, however, as these were completed and the menace of Russia became less alarming, the Korean construction program was slacked up. Regulations for private railway enterprises were promulgated and encouragement extended to private capital in order to develop the districts off the main trunk lines operated by the government. Recently, however, the Korean government has taken a renewed interest in railway development. A plan was devised in 1921 for building a net-work of 65 lines with a total length of 5,000 miles to be completed in 1927. This scheme, however, is being held up for lack of funds due to the continued depression in Japanese financial circles. This one fact will help to understand the importance attached by the Japanese and Korean governments to the rapid development of the country and the exploitation of its agricultural, and other resources in order that the empire may be self-supporting as soon as possible. The present mileage of the Korean state owned railways in operation is 1,165 miles, with 465 miles of private owned lines in operation and under construction out of a total of 1,668 under charter. Although the rapid completion of this program will depend largely on the ability to finance it, it is safe to predict that it will be carried through within a reasonable time and the little peninsula of Korea will boast as many miles of railways as the vast territory of its huge neighbor.

State Owned Railways

The following brief resumé of the government operated lines in Korea will serve as a basis for the information about the private owned railways and tramways. The first railway in Korea was the Seoul-Chemulpo line opened to traffic in 1899. In 1901, the Seoul-Fusan (Kei-Fu) Railway Company was established and commenced the construction of the southern link of the main trunk line from Seoul to the port of Fusan. In 1903 this company acquired the line from Seoul to Chemulpo.

In 1904 the line between Seoul and Fusan was opened to traffic, and in 1905 the line between Seoul and Shingishu and the Basan line were completed for the use of the army during the Russo-Japanese war. In 1906 the Japanese imperial government bought out the Kei-Fu Railway Company and took over the Keijo-Shingishu and the Basan lines from the department of war, and all were placed under the control of the railway superintendence bureau of the residency-general of Korea.

In 1909 they were again made part of the Japanese government railways, but, on the government-general of Korea being established in 1910, control once more changed hands. During all this time improvement and construction work was steadily carried on, and the year 1910 saw the completion of the line between Heijo and Chinnampo ; in 1911 the Yalu was spanned by an iron bridge, connecting the Korean railways with the South Manchuria railway ; in 1914 the line between Taiden and Moppo and that between Keijo and Gensan were completed ; in 1915 part of the line between Gensan and Kwainei was opened. The last named is still under construction, but traffic is being regularly conducted between Seishin and Kwainei and Yujo and Shuotsu in its northern part and between Gensan and Kanko in its southern part.

Single control of the railways in Korea and Manchuria being considered advisable on account of their economic and communicative relations, the government-general of Korea in accordance with an imperial ordinance of the 31st of July, 1917, concluded a contract with the South Manchuria Railway Company entrusting to it the management of all the state-owned railways in Korea from the 1st of August following.

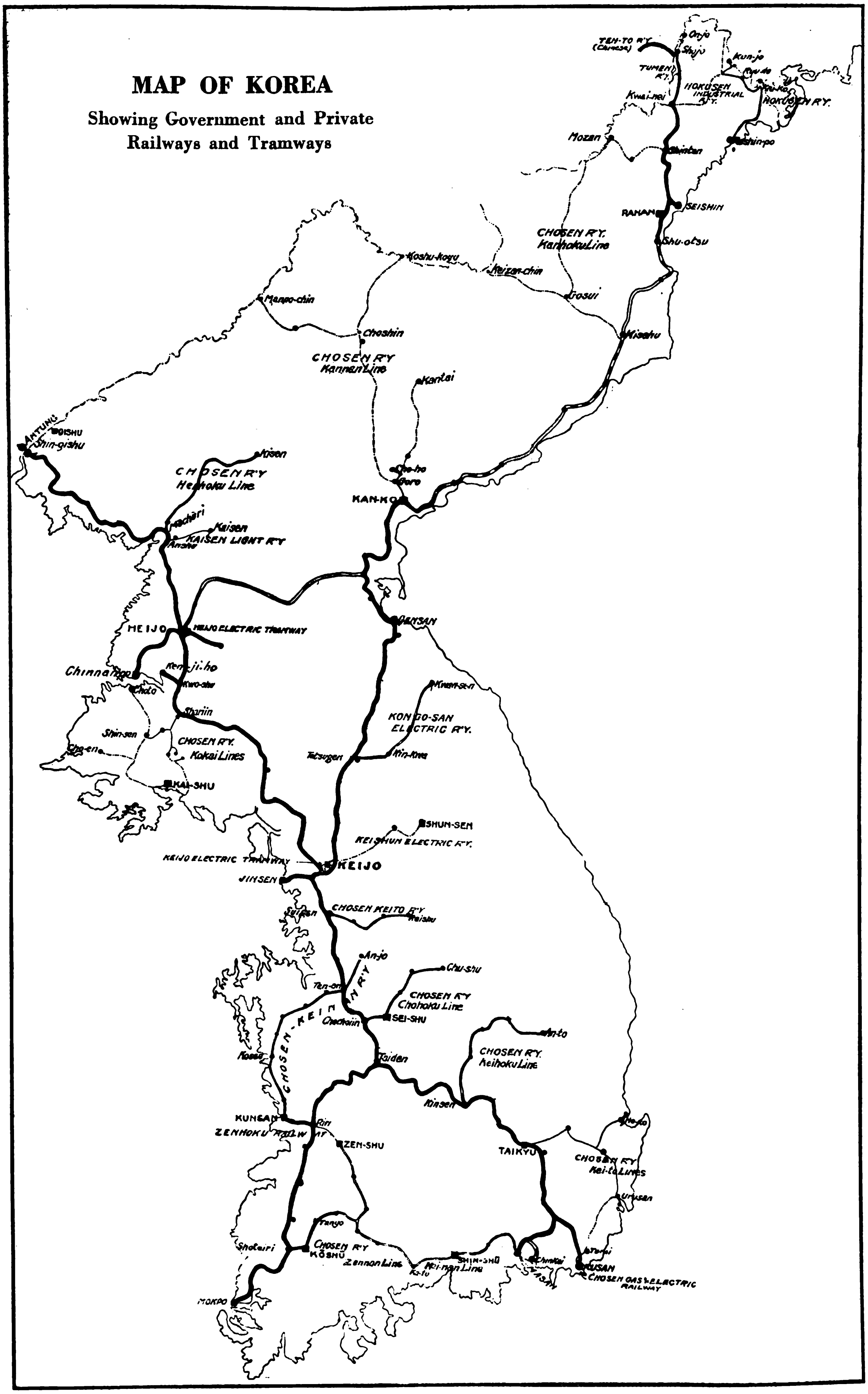
According to this contract the entire management of the state-owned railways in Korea, except the formation of plans for new construction and improvement and the provision of capital for the purpose of carrying them out, was entrusted to the South Manchuria Railway Company for twenty years, on condition that out of the net earnings the equivalent of 6 per cent. on the total amount of capital furnished by the government-general since the fiscal year 1911 be paid to government-general each year, and in the event of the profit gained falling short of that amount in any one year, the deficit to be made good out of the profits of succeeding years, while should the profit exceed the amount required, half such excess was also to go to the government-general. This arrangement was superceded by another contract signed on the 23rd of July, 1918, relieving the S.M.R. Company from paying over the half of any excess profit obtained, but requiring it to bear construction costs.

A new contract for three years, beginning with the 1922 fiscal year, was concluded in August, 1920, on the basis of the old one, with the provision that the S.M.R. Company should pay to the government-general the equivalent of 6 per cent. on the total amount of the capital advanced by it up to the end of the fiscal year 1920, and 4 per cent. on the capital furnished by it each subsequent year.

The following table gives some idea of the railway development:—

Fiscal Year	Length Miles	Passengers	Freight Tons	Receipts Yen
1921 ..	1,165.4	13,821,144	3,311,391	24,815,997
1920 ..	1,157.4	12,421.441	3,186,073	23,816,807
1919 ..	1,153.2	12,184,485	3,642,829	21,635,968
1910 ..	674.6	2,024,490	888,723	4,095,752

Though railway rates and charges had not been revised since 1912, the increase in expenditure owing to the rise in price of commodities at length required this to be done, but great care was taken to make them no higher than absolutely necessary.

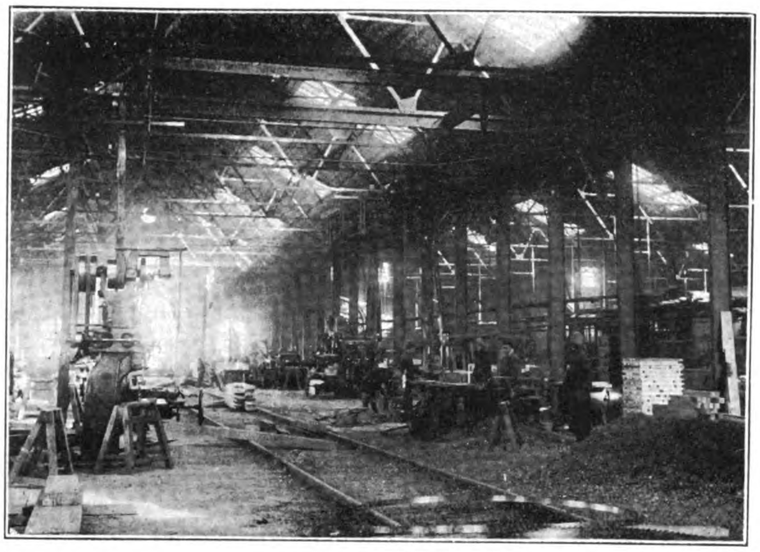


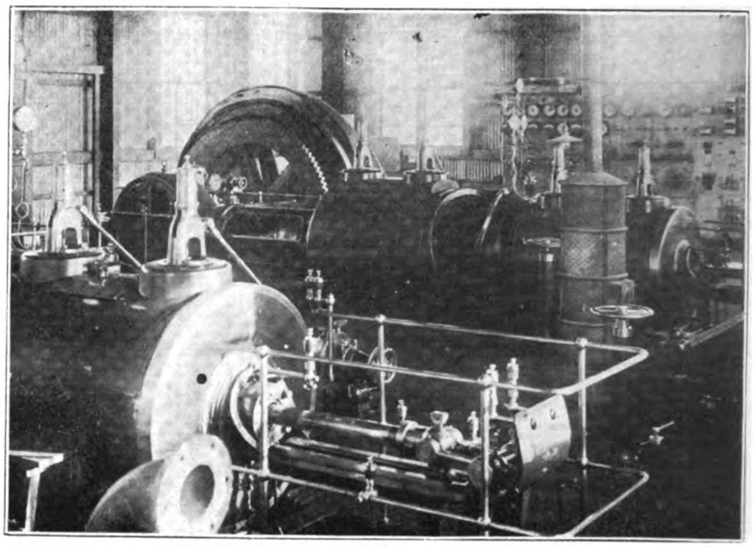
The hotel business as an adjunct to the railway business was first started at Fusan in 1912 for the convenience of foreign tourists, by making use of the upper stories of the station there, and later on, in Shingishu. In 1914, the Chosen Hotel was established on a large scale in Keijo, and branches of it at Kongozan for the convenience of sight-seers there, one at Onseiri and one at Choanji.

Warehouses were established in 1913 at Keizan and ten other places, and as time went on, were erected in other important centres. Storage yards were also prepared to cope with the prevailing congestion, and 67 points along the railways are now provided with warehouses or sheds, the number of warehouses being 58.

New Construction

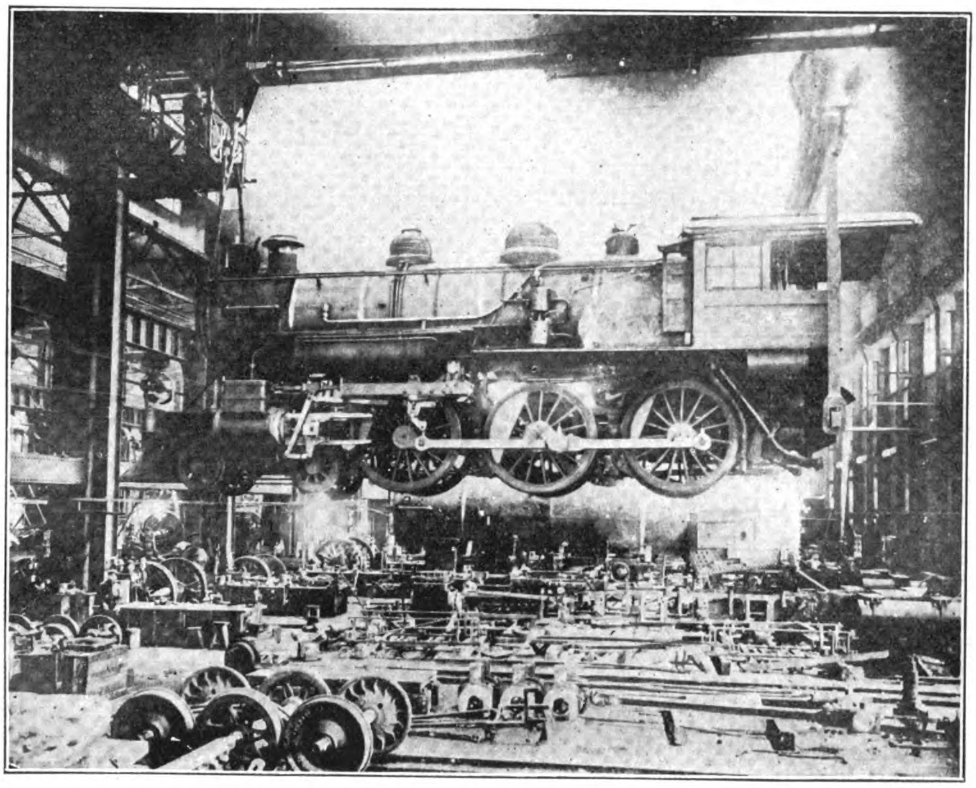
As regards new construction and improvement of existing lines, the Kei-Fu line has been continually improved since the fiscal year 1914, while the new lines Taikyu-Kinsen and Taiden-Fuko were completed in the fiscal year 1916, and the Kinsen-Taiden in the fiscal year 1919, while the new line between Soryo and Fusan-chin and that near Keijo are now in the course of construction. The Kankyo line in the north-east between Gensan and Kwainei totals over 376 miles in length and has a branch line running between Yujo and Seishin. Of this the parts between Gensan and Eiko and Seishin and Kwainei were completed in 1916 and 1917 respectively, between Eiko and Kanko and Yujo and Ranan in 1919, between Ranan and Kyojo, in 1920, and between Kyoko and Shuotsu this fiscal year. In the west, the Heijo Colliery Railway bought the line between Birin and Shosorai from the Onoda Cement Company and opened it to traffic in 1918, and the Konan line started work on a track between Taiden and Moppo and between Riri and Gunsan in 1910, and opened both to business in 1914.





Of the lines now under construction or projected, the Kankyo line will be completed in the fiscal year 1927, the Chinkai line in the fiscal year 1925, and a double track between Keijo and Fusan and between Keijo and Shingishu will be laid, and new lines between Keijo and Koryo, and Gensan, Koryo and Fusan, started as soon as financial conditions will allow.

It is also planned to start construction of a line between Heijo and Kogen, 133 miles in length, at the estimated cost of Y.51,600,000 in 9 consecutive years ending in the year 1930. This line, when completed, will prove of great importance as a link

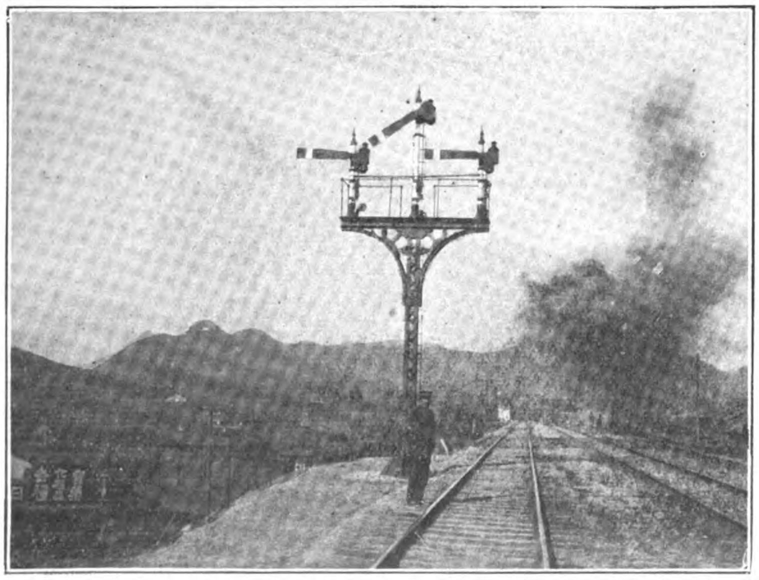


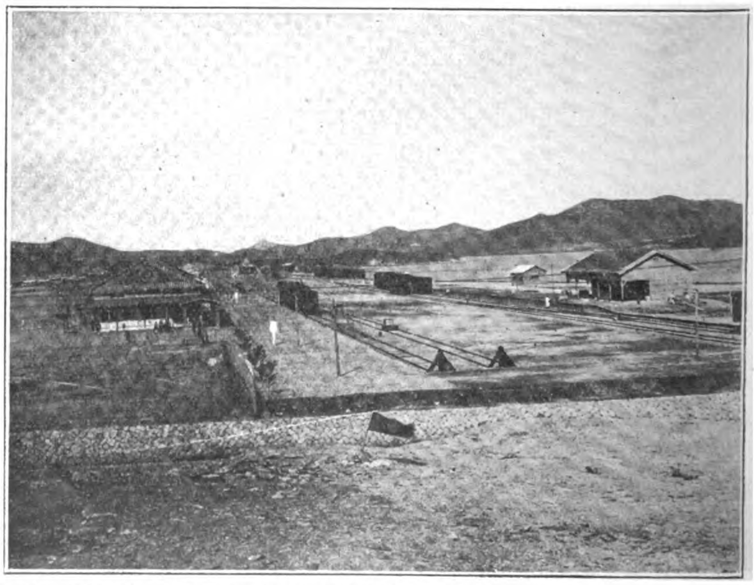
in the chain of traffic connecting South Manchuria and Japan.

Private Railways in Korea

Many excellent transportation projects have been devised for opening up and exploiting the back districts of Korea and during the war several private companies sprang into existence and received concessions from the government but the subsequent slump and tightening of the money market caused most of them to go out of business, or curtail their activities.

At the height of the railway boom there were over twenty companies organized





KOREAN GOVERNMENT RAILWAYS, OPERATED BY THE S.M.R.

Ryusan Workshops, Boiler Shop

Erecting Shop

Engine Room, Ryusan Shops

Nandaimon Station Yard, Seoul

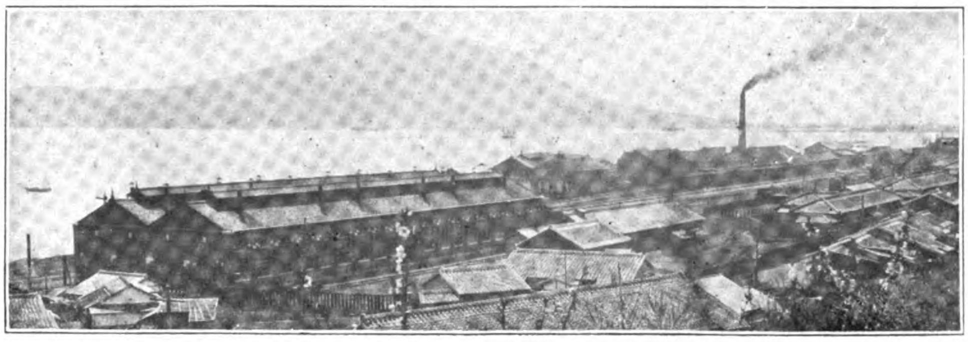
Moppo Station

to construct lines under the government guarantee. Since then, several companies have amalgamated their interests and there are now only six private lines in operation with four companies possessing charters which have not yet perfected their construction plans.

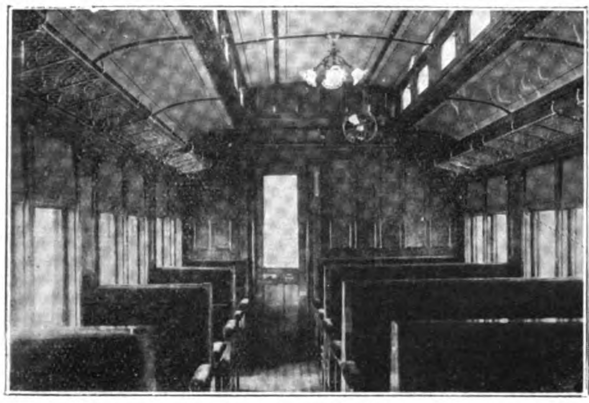
These enterprises were the outgrowth of government regulations promulgated in 1912 for the encouragement of private railway and tramway construction, supplemented in 1914 by further provisions conceding a six per cent. subsidy to important lines in order to meet any deficiency in profit below this percentage on the paid-up capital. The subsidy was raised to seven per cent. in 1918 and to eight per cent. in September 1919. New regulations relating to the subsidies were drawn up and promulgated in 1920. As the light railway law also required revision, the Chosen private railway regulations were published in June 1920, limiting the motive power to steam and electricity and fixing the gauge as standard. These regulations also provided for an increase in capital, issue of debentures, amalgamation of companies and other important matters, so that several companies which found it difficult to finance their undertakings, were enabled to amalgamate their interests under one corporation.

Of the six private railways now in operation, five are owned by joint-stock companies and one by a private individual, in addition to four companies which have not as yet perfected their plans. The total length of the lines in operation owned by these companies is 346 miles with 119 miles under construction and a total of 1,668 miles under charter. The combined authorized capital of these companies is Y. 73,100,000, of which Y.29,100,000 is paid up, with loans outstanding to the amount of Y.17,611,000. The government subsidy has been extended to all these joint-stock companies to the extent that if the railway fails to make an eight per cent. profit on the paid-up capital and the loans for construction purposes, the government makes good the deficiency. The government, however, limits this subsidy to fifteen years from the date of registration of the company's establishment or the date of registration for a loan or the day the loan was contracted.

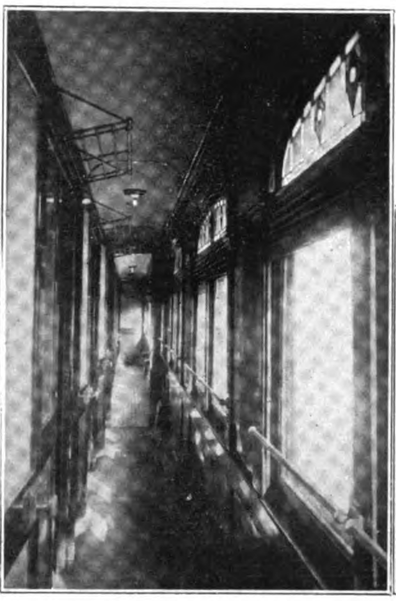
Even with these encouragements the progress of new private railway construction in Korea has been slow. The private companies,



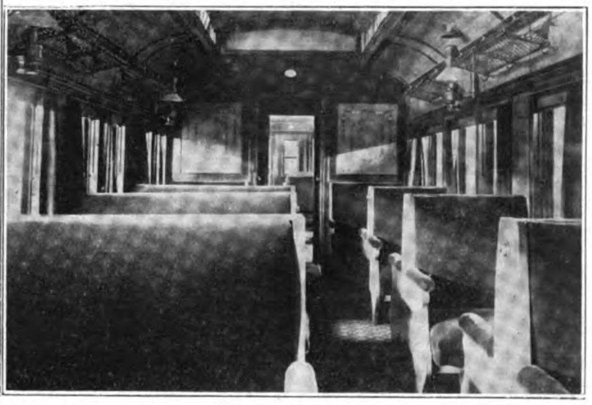
Railway Workshops at Ryuzan (top) and at Fusan (bottom)



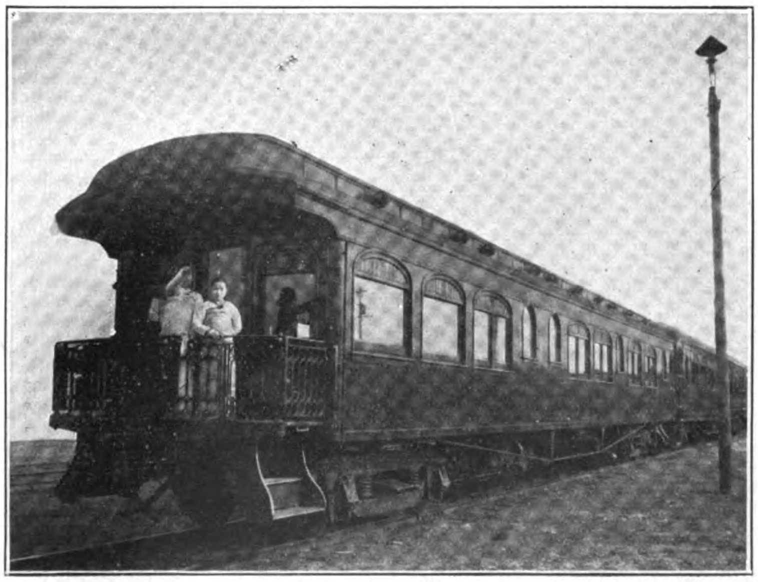
1st Class Car

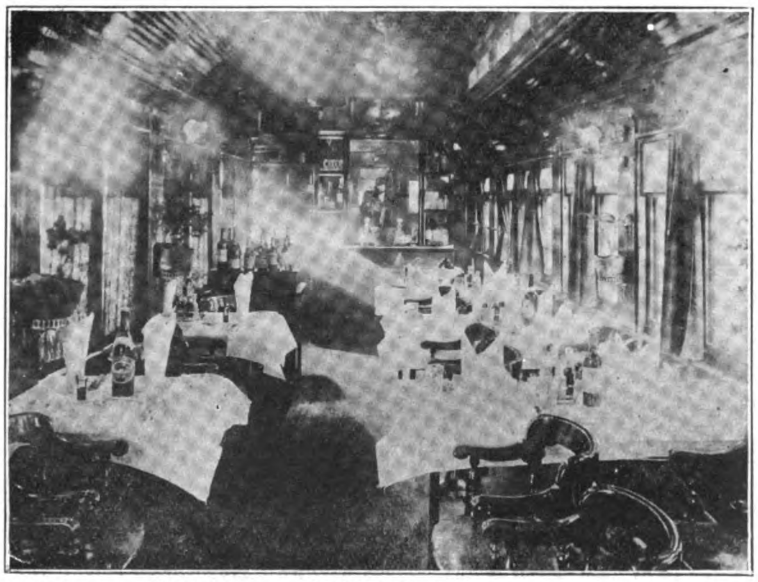


Corridor of Sleeping Car

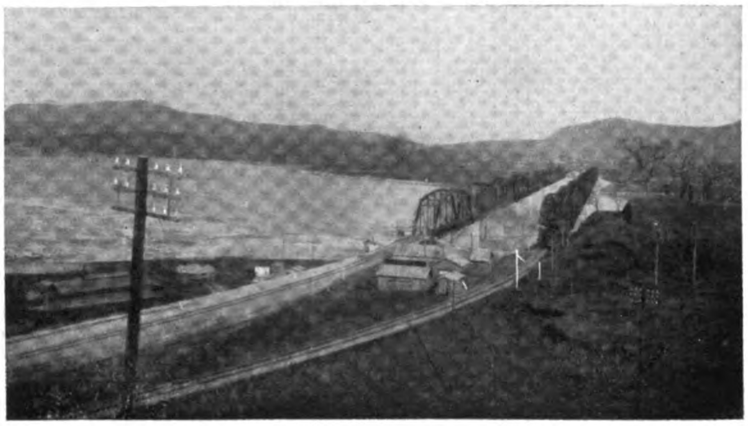


3rd Class Car





Luxurious Traveling on the S.M.R. Express through Korea: Observation and Dining Cars



Railway Bridge over the Kan River

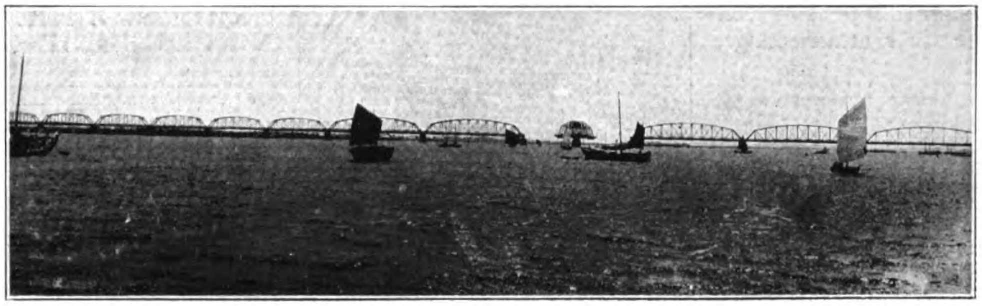
despairing of obtaining funds in the Japanese market under present financial conditions, have placed their propositions before American bankers, while the imperial authorities and the government-general of Korea have modified their old policy and now welcome the use of loans for the completion of these much needed railways. The following summary of the private railways in Korea will give some idea of the extent and importance of their building program :—

The Chosen Railway Co., Ltd.

This company was established in September 1923 as the result of the amalgamation of the Chosen Central Railway Company with five other companies. Its authorized capital is Y.54,500,000 of which Y.17,650,000 is paid up, with loans outstanding amounting to Y. 13,650,000. The total mileage which the company has the right to build is 1,187, covering lines which extend to every province except Keiki, Chunan, Heinan and Kogen. At present, 211 miles are in operation with 101 miles under construction. The head office of the company is at Keijo with a branch in Tokyo and sub-offices in Seishu, Kinsen, Daikiu, Masan, Koshu, Sariin, Kanko and Komosam. The various lines operated are as follows :

The Chuhoku Line : This standard gauge line branches off the main Korean government Keijo-Fusan railway at Chochiin and extends to Chushu via Seishu, the seat of the Chuseihoku-Do government. Its total length is 58 miles of which only the section between Chochiin and Seian (29 miles) is open for traffic.

The Zennan Line : This standard gauge line branches off the government Konan line at Shoteiri and terminates at Masan by way of Koshu where the government of the Zenra-nan-Do is located. The total length is 139 miles with only the 22.7 mile section between Shoteiri and Tanyo in operation.



Railway Bridge over the Yalu River

The Keihoku Line : This standard gauge line branches off the main Korean government Keijo-Fusan railway at Kinsen and traversing the northern part of the Keisho-hoku-Do, terminates at Anto. The total length is 73 miles with the section between Kinsen and Eiko (38 miles) now under construction and expected to be ready for operation by the end of this year.

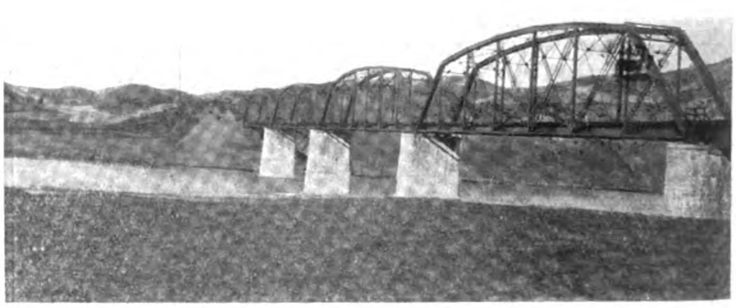
The Keito Line : The gauge of this line is 2-ft. 6-in. It starts at Taikiu on the main Keijo-Fusan government line and terminates at Hoko on the eastern coast. Another line branches off at Seigaku and extends to Torai by way of Urusan. There is also another section between Urusan and Choseiho. The total length of railway to be built by the company is 132 miles with two sections of 92 miles in operation between Seigaku and Urusan and between Daikiu and Kakusan. The business outlook for this line is very bright as it traverses a territory rich in agricultural resources with its terminus at the port of Hoko, one of the most important fishing centres on the eastern coast, assuring to it a large volume of profitable traffic in fishery products.

The Keinan Line: A standard gauge line starting from the terminus of the Masan line meeting the Zennan line at Kato passing through Shinshu, the seat of the Keisho Nan-Do government. For 69 miles, the Keinan line forms a part of the main line. A section between Masan and Gunhoku (18.3 miles) is open to traffic and the section between Gunhoku and Shinshu (25 miles) will soon be completed.

The Kokai Line: The projected sections of this line are as follows :

(1) 51 miles from Sariin on the Keigi line to Choto, opposite Chinnampo.
(2) 9.4 miles from Jokai to Ginzanmen.
(3) 32.4 miles from Kasan on the Ginzanmen line to Kaishu, the seat of the Kokai-Do government.

Railway Bridge over the Rakuto River

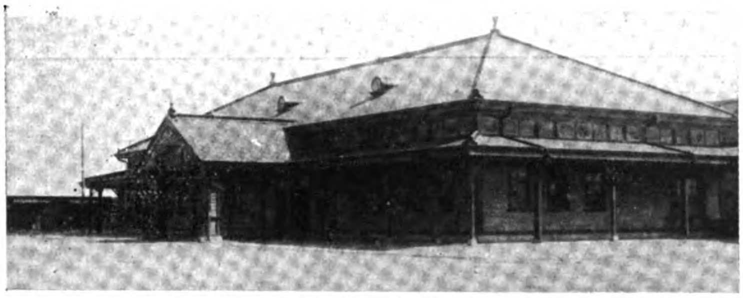


Railway Bridge over the Kin River

KOREAN STATION BUILDINGS AND HOTELS OPERATED BY THE S.M.R.

Offices of the Korean State Railways at Ryuzan, near Seoul

Ryuzan Station



Kunsan Station

Heijo Station

Taikyu Station

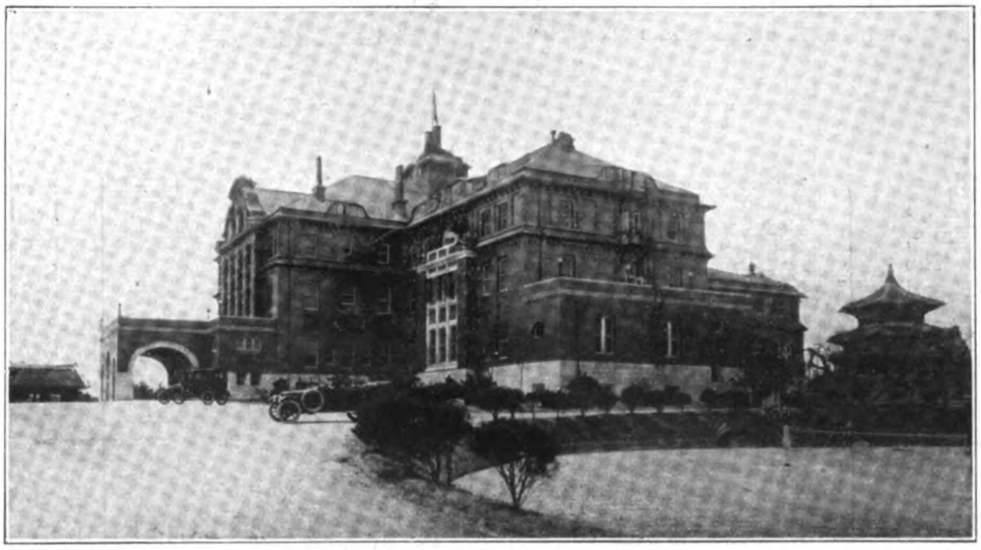
Shingishu Station and Hotel

(4) 3.2 miles from Shinin to Kaseimen.
(5) 47.4 miles from Shinsen on the Choto line to Ryutoho by way of Kaishu.
(6) 18.6 miles from Rihoku to Choen.

The total length is 162 miles with the sections between Sariin and Shinsen and between Jokai and Naido (31.2 miles in all) in operation. The section between Kasan and Miriki (5 miles) was opened to operation on September 1 of this year and the section between Miriki and Kaseimen (9.2 miles) is under construction. The transportation of agricultural products from the fertile plains served by the line as well as iron ore from the Ginsanmen district are the most important sources of revenue.

The Heihoku Line: A standard gauge project 77 miles in length connecting Mochuri on the Keigi line with Kisen, on which no work has been done to date.

The Kannan Line: A 2-ft. 6-in. line starting from Kanko and extending to Koshu, Koyu and Manpochin, a total distance of 218 miles. There are two branches, one from Goro-ri to Kantai-ri (53 miles) and the other from Hojo to Choho, 1.7 mile. This line is primarily intended to transport lumber from the forest districts of the upper Yalu. Choho is the terminus of the Kanko-Choho line (17.7 miles) in which district is located the Kanko coal mine which has a daily output of 100 tons, but is capable of considerable expansion with proper railway facilities to transport the coal to market.



The Chosen Hotel at Seoul, Operated under Contract by the South Manchurian Railway Company for the Korean Government Railways

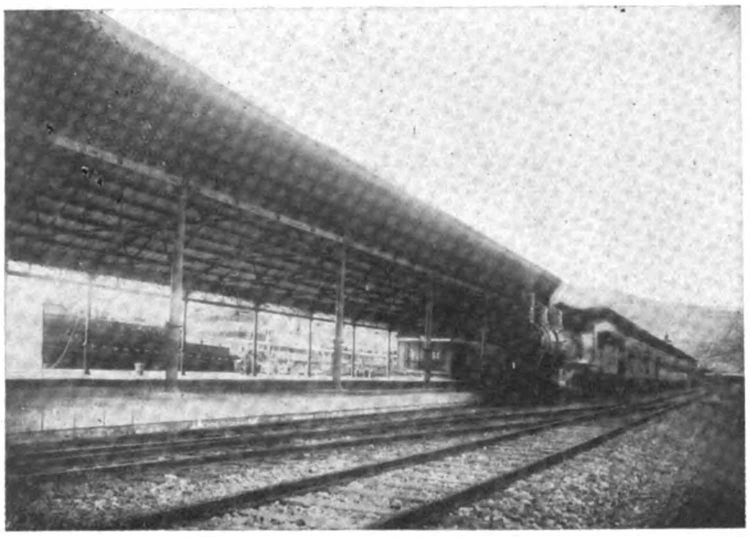
The Kanhoku Line: This line, also of 2-ft. 6-in. gauge, like the Kannan line, was designed to transport timber from the upper Tumen River district. Starting from Kichishu, it will proceed to Keisanchin a distance of 205 miles. A branch is to start from Gosui and end at Komosan on the Seikai line. At present, the 24-mile section between Komosan and Shintan is under construction.

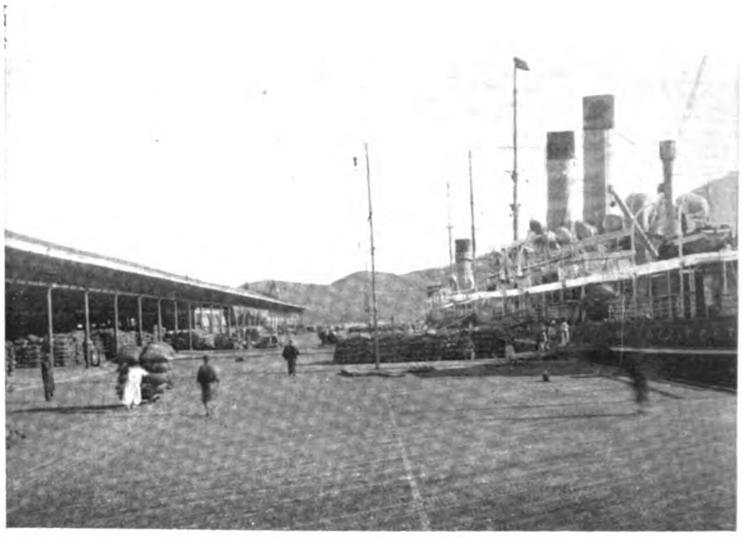
FUSAN, THE GATEWAY TO KOREA

General View of the Port of Fusan, Showing Location of Railway and Steamship Wharf

The Chosen Keinan Railway Co., Ltd.

The authorized capital of this company is Y.10,000,000, half paid up and with loans outstanding to the amount of Y.2,100,000. The head office is located at Ten-an on the main Keijo-Fusan government railway. The line starts from the other side of Gunsan and extends to Anjo in Keiki-do by way of Tenan, a distance of 99 miles. The section between Ten-an and Kosan (46.8 miles) has been completed and is now in operation. The line is standard gauge.

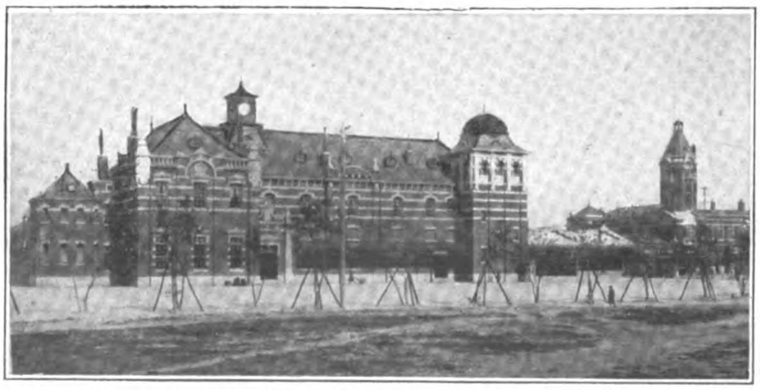




Fusan Pier
Showing Direct Connection Between Rail and Steamship

The Zenhoku Railway Co., Ltd.

This company with its head offices at Zenshu, the seat of the Zenra Hoku-Do government; has an authorized capital of Y.600,000 of which Y.450,000 is paid up and a loan amounting to Y.60,805 outstanding. The line, 2-ft. 6-in. gauge, is in operation on the section between Riri on the Konan line and Zenshu, a distance of 15½ miles. There is a vast stretch of rich agriculural land in the district served, contributing a very profitable goods and passenger traffic, enabling the company to pay more than eight per cent. dividends without the help of the subsidy. The business outlook for this line is very bright.



Station Hotel at Fusan Terminus of the Korean Railways

The Tumen Railway Co., Ltd.

The head office of this company is in Tokyo with the

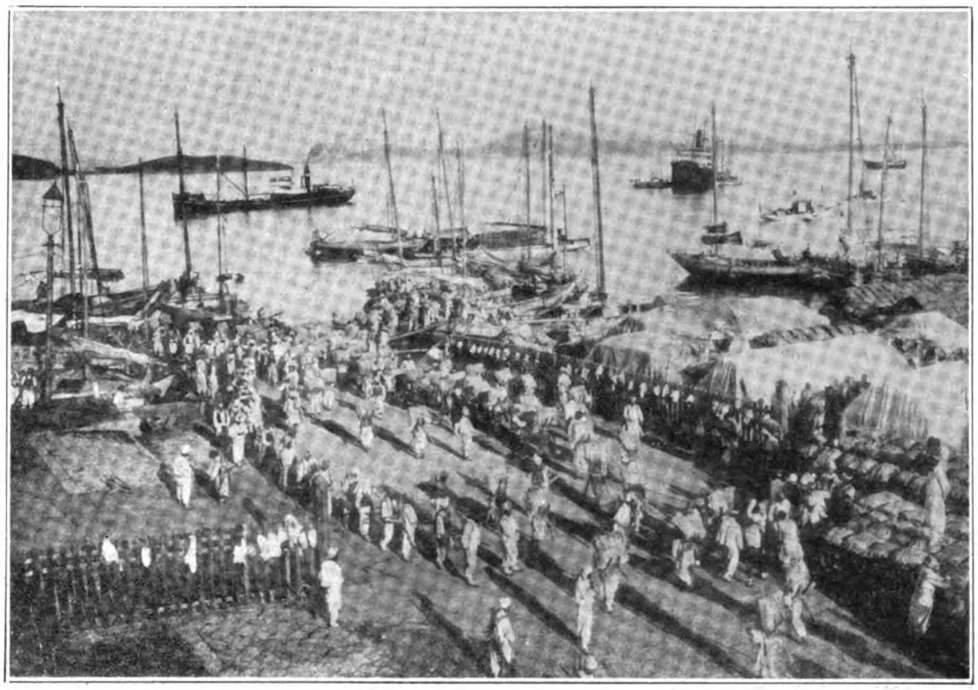
Mokpo, an open port on the South-Western Coast of Korea, the terminus of the Government Kanan Line

Masanpo, a port on Chinhai Bay, 55 miles west of Fusan, terminus of the Government Railway

operating office in Kainei. It has a capital of Y.3,000,000 all paid up with an outstanding loan of Y.100,000. Of the projected 57 miles of lines, a section of 31.5 miles between Kainei (on the Seikai line and Shojo) is now operating and the section between Shojo and Shokanchin (5½ miles) under construction. When all the line is completed it will be utilized for the transportation of agricultural produce from the Kanto district. The Chinese Tento railway having been recently opened to traffic, it is expected that the volume of business over the Tumen line will be greatly increased. To facilitate means of transportation in the district the Tumen railway company is operating motor cars between Shojo, Onjo and Keigen.

The Kongosan Electric Railway, Ltd.

The head office of this company is located at Tetsugen, in Kogen-Do. Its authorized capital is Y.5,000,000 with Y.3,000,000 paid up and a loan outstanding amounting to Y.4,200,000, in which the fund for subsidiary undertakings is included. The company has erected a hydro-electric plant at Kasen, in Kogen-Do and is constructing an electric standard gauge railway 63 miles long, connecting Tetsugen with Kasen near Kongo-san and supplying electricity to the towns along the line. The section between Tetsugan and Kinka (18 miles) is completed and the necessary electric equipment was ordered from Japan. Due to the destruction of this equipment during the quake and fire of last year, its delivery has been delayed. In the meantime the company is operating steam locomotives to haul its trains over the open section. A summary of the equipment for this line is given further on.



Kunsan, a busy Rice Port on the Western Coast of Korea, served by the Government Kanan Line and the Chosen Keinan Railway

The Kaisen Light Railway

This 2-ft. 6-in. gauge line is owned and operated by a private individual, Mr. Masanobu Tannowa. It is 23 miles long connecting Shin-Anshu (on the Kaigi line) with Sendo via Kaisen. This line was originally built for the exclusive transportation of iron ore for the Hokkaido steel company but owing to the gradual increase of passenger and goods

The Port of Gensan, the Principal Port on the Eastern Coast of Korea

The Town of Yeiko, near Gensan

traffic along the line it was turned over for the public use. It is operated for the present without the subsidy.

Other Railways

In addition to the above lines, the following four companies have been incorporated but have not yet completed their construction plans:—The Hokusen Railway Company, The Hokusen Kogyo Railway Company, The Keishun Electric Railway Company, and the Chosen Keito Railway. The projected length of the Hokusen railway is 85 miles connecting Rashin in Kankyo-Hoku-Do with Kunju. The section between Kainei and Kindo (46½ miles) will be operated by the Hokusen Kogyo Railway Company and the section between Suigen (Keikido) and Reishu (43.1 miles) by the Chosen Keito Railway. These lines are all of standard gauge. The Keishun Electric Railway Company have been granted a charter to build and operate a 3-ft. 6-in. electric line between Keijo and Shunsen a distance of 49.6 miles, but the company is not yet officially established.

Summary of Private Railway Statistics

Zenhoku Railway Company

Head Office, Zenhsu : *Capital, authorized*, Yen 600,000, *paid up*, Yen 450,000, *loans*, Yen 60,805 : *Construction costs*, Yen 510,326 : *Gauge*, 2′6″ : *Locomotives*, 6 : *Passenger cars*, 14 : Covered wagons, 21 : Open trucks, 32 : Section operated, Riri-Zenshu, 15.5 miles : No. of trains, 6 : Number of passengers, 424,873 : Freight, 64,738 tons : Revenue, Yen 261,543 : Expenditures Yen 204,926 : Profit, Yen 56,617 : Government subsidy, none.

Tumen Railway Company

Head Office, Tokyo : *Capital, authorized*, Yen 3,000,000, *paid up*, all, *loans*, Yen 100,000 : *Construction costs*, Yen 2,987,819 : *Gauge*, 2′6″ : *Locomotives*, 8 : *Passenger cars*, 10 : Covered wagons, 55 : Open trucks, 35 : Subsidiary undertakings, Motor car transportation from Shojo to Keigen and Onjo. Sections operated, Kainei-Shojo : Mileage, 31.5 : Number of Trains, 3 : No. of passengers, 109,011 : Freight, 80,284 tons : Revenue, Yen 526,706: Expenditures, Yen 313,608 : Profit, Yen 213,098 : Government subsidy, Yen 85,780.

Chosen Keinan Railway

Head Office, Ten-an : *Capital, authorized*, Yen 10,000,000, *paid up*, Yen 5,000,000, *loans*, Yen 2,250,000 : *Construction expenses*, Yen 6,154,861 : *Gauge*, 4′8½″ : *Locomotives*, 4 : *Passenger Cars*, 6 : Covered wagons, 2 : Open trucks, 50 : Sections operated, Ten-an to Kosen : Mileage, 46.8 : Number of trains, 3 : No. of passengers, 227,222 : Freight, 77,730 tons : Revenue, Yen 284,242 : Expenditures, Yen 228,759 : Profit, Yen 55,483 : Government subsidy, Yen 422,339.

Kaisen Light Railway

Head Office, Gunguri : *Capital, authorized*, Yen 792,500 : *Construction expenses*, Yen 798,500 : *Gauge*, 2′6″ : *Locomotives*, 6 : *Passenger Cars*, 8 : Covered wagons, 6 : Open trucks, 74 : Setcions operated, Shinanshu-Kaisen-Sendo : Mileage, 23 : No. of trains, 4 : No. of passengers, 107,781 : Freight, 75,761 tons : Revenue, Yen 128,138 : Expenditures, Yen 120,710 : Profits, Yen 7,428 : Government subsidy, none.

Chosen Railway

Head Office, Keijo (Seoul) : *Capital, authorized*, Yen 54,500,-000, *paid up*, Yen 17,650,000, *loans*, Yen 13,150,000 : *Construction expenses*, Yen 29,369,178 : *Gauge*, 2′6″ and standard : *Locomotives*, narrow gauge, 22, standard gauge, 8 : *Passenger cars*, n.g., 84, s.g., 14 : Covered wagons, n.g., 125, s.g. 13 : Open trucks, n.g., 264, s.g., 28 : Subsidiary undertakings, warehouses, and hot springs at Shinsen and hotel at Bukkokuji : Sections operated, Narrow Gauge lines, *Keito Line*, Daikyu-Hoko-Kakusan, 4 and 3 trains daily : Seigaku-Urusan, 92 miles. *Kokai Line*, Sariin-Shinsen and Naido-Jokai, 4 and 2 trains daily : 31.2 miles : *Kannan Line*, Kanko-Goro-Choho, 17.7 miles, 4 and 3 trains daily. Standard Gauge lines : *Keinan Line*, Masan-Gunhoku, 18.3 miles, 4 trains daily : *Zennan Line*, Shoteiri-Tanyo, 22. 7 miles, 7 trains daily : *Chuhouk Line*, Chochiin Seian, 29 miles, 4 trains daily.

Number of passengers, 1,380,573 : Freight, 266,435 tons : Revenue, Yen 1,333,467, Expenditures, Yen 1,149,472 : Profits, Yen 183,995 : Government subsidy, Yen 1,835,878.

Note.—The railway fare is five sen per mile and first class eight sen. Freight is charged one sen per mile per 100 *kin* for light articles and 13 sen per ton for bulky goods, with a charge of ten sen per mile per ton for hired cars.

Electric Railways and Tramways

The Kongo-San Electric Railway

The power for operating this line will be obtained from the Kasen River one of the tributaries of the upper Kan, at a point 1,600 *shaku* above the level of the sea. Here a large reservoir has been created by damming the Kasen River with a stone dam faced with concrete 88 *shaku* high, 61 *shaku* at the bottom and 12 *shaku* at the top. The capacity of this reservoir is about 400,000,000 cubic feet, assuring a steady volume of 142 cubic feet at all seasons with a head of 773 *shaku* for operating the Number 1 power house of 6,900 k.w. capacity. Two smaller plants will be erected lower down the stream to be called the No. 2 and No. 3 power houses, the first to have a capacity of 3,400 k.w. with a head of 400 *shaku* and the other of 1,800 k.w. capacity with a head of 209 *shaku*. There is also a small steam plant generating 300 k.w., making a total power capacity of 12,400 k.w. which the company will develop as the demand for power and light requires. Equipment for generating 3,200 k.w. at the No. 1 power house was installed by November of last year and by the end of the present year the remaining equipment for operating the full capacity of the plant will be in place.

The head-gate is located about a mile lower than the reservoir. A concrete weir has been built at this place. The head race, 4,800 *shaku* long, was cut for the most part through solid rock and finished with concrete. The gradient between the head-gate and the pressure tank is 5 *shaku* giving a volume of 185 *shaku* per second. From the pressure tank the water is conveyed to the power house through two lines of flanged riveted steel pipes.

The No. 1 power house is a brick building divided into two parts. The first is a one-storied building 58 by 48 *shaku* housing the engine room and the other a two-storied building with the transformer room on the ground and the switchboard and distributing apparatus on the second. The machinery consists of one 4,600 h.p. water turbine driving a 4,063 k.v.a., 6,600 volt alternator at 514 r.p.m. and one 5,300 h.p. turbine driving a 4,700 k.v.a., 6,600 volt at 450 r.p.m. The exciter for the first set is 45 k.w., 124 volt and for the second set, 50 k.w., 125 volts. Four transformers (one in reserve) of 1,375 k.v.a. each and another set of four (one spare) of 1,600 k.v.a. raises the primary pressure of 6,000 volts to 66,000 volts.

The transmission lines from No. 1 power house to the Dojori sub-station (52 miles) are carried on iron towers. Between Dojori and the Tetsugen transformer station (5 miles) wooden poles are used. Iron towers and wooden poles are used to carry the transmission line between Dojori and the Keijo transformer station (50 miles), a total distance of 102 miles from the power house to the capital. A large amount of the current already generated is being used in Keijo, for commercial light and power. The iron towers are of mild galvanized steel 68′ to 70′ in height, the standard distance between towers being 600 *shaku* and the maximum distance, 842 *shaku*. Six overhead wires (three wires not yet strung) and one underground wire are laid. Larch poles 35 *shaku* and 55 *shaku* in length and .7 *shaku* diameter at the top are also used either singly or the shape of a triangle, the standard distance between each being 150 *shaku* and the maximum, 780 *shaku*. Three overhead and one underground wire are laid.

The wires are of hard drawn copper, No. 12 B.S. the distance between each being 7 feet. Transformer stations are located at Keijo and Tetsugen. The railway starts from Tetsugen station on the Keijo-Gensan main line and proceeds to Kasen via Kinka, Kinjo, Shodo and Shinan, a total distance of 63 miles. Kongo-san lies about 20 miles to the west of Kasen, the terminus of the line. The section between Tetsugen and Kinka (18 miles) was opened to traffic on August 1st of this year and the section between Kinka and Kinjo (14 miles) now under construction, will be completed next year.

1 *shaku*—0.994194 feet.

The line is standard gauge, single track, laid with 60-lbs. rails. The overhead line is of No. 30 hard-drawn copper wire. single trolley, catenary system using 1,500 volts d.c. The passenger cars are of the bogie type 45 *shaku* long over-all equipped with four 70 h.p. motors each capable of drawing a 30-ton goods wagon on a ruling gradient of one in forty. The cars are equipped with pantagraph, Westinghouse air-brakes and electric radiators. There are three cities in Korea where tramways are now in operation.

The Keijo Electric Tramway Company, Ltd: The head office of this company is in Tokyo with its operating office in Keijo (Seoul). Besides operating the tramway the company also supples electric light and power and gas. The length of open lines is 18.9 miles, that is, 9.9 miles of double track and 9 miles of single track section. The company is preparing to extend its lines to keep pace with the construction of new roads in the city. The line is a single trolley system with the power supplied from the company's own plant. The cars are operated from 5.30 a.m. until 1 a.m. and in the city districts there is a car every two to seven minutes, in the suburban districts, every nine minutes.

Capital, authorized, Yen 15,000,000, paid up, 10,000,000: Construction costs, Yen 3,352,339 : Gauge, 3'6" : Cars, 123 : No. of daily passengers per mile, 561 : Passengers carried, 33,105,468 : Fare, average, 5 sen : Revenue, Yen 1,614,478 : Expenditures, Yen 1,021,974 : Profits, Yen 592.504.

The Heijo Electric Tramway : This tramway is owned and operated by the Heijo prefectural government. It is double tracked 2.8 miles long of the single trolley system receiving its power from the plant of the Chosen Electric Industrial Company. Operating hours are from 4 a.m. to 1 a.m. with intervals of six to eight minutes between cars.

Head Office, Heijo: Capital, Yen 480,000: Paid-up, Yen 480,000 : Construction costs, Yen 480,000 : Gauge, 3'6" : Cars, 10 : Miles operated, 2.8. : No. of daily passengers per mile, 388 : No. of passengers, 2,307,807 : Fare, 5 sen per section—two sections : Revenue, Yen 112,549 : Expenditures, Yen 73,442 : Profits, Yen 39,107.

The Fusan Electric Tramway : This tramway is owned and operated by the Chosen Gas and Electric Company, Ltd., whose head office is in Tokyo and operating office in Fusan. Besides operating the tramway the company also supplies electric light and power and gas. The line is of single track, but double tracks are now being laid in the urban districts. It is of the single trolley system with the power supplied from the company's own plant.

Capital authorized, Yen 3,000,000, paid-up, Yen 2,700,000, loans outstanding, 530,000 : Construction costs, Yen 671,260 : Gauge, 2'6" : Cars, 15 : Miles operated, 10.7 : No. of passengers per mile per day, 133 : Total passengers, 4.400,758 : Fares, 5 sen per section (6 sections), Revenue, Yen 273,828 : Expenditures, Yen 199,198 : Profits, Yen 74,630.

Tokyo's Electric Light and Power Supply

The damage to electric lights and decrease in the consumption of power in and around the city of Tokyo, as a result of the quake in September, 1923, has been practically restored to former conditions.

Up to 80 per cent. of the total electric light and power consumption in Tokyo has been covered by the Tokyo Electric Light Company, Ltd. (Tokyo Dento Kabushiki Kaisha), and the remaining 20 per cent. by the Denki-kyoku or the electric bureau of the Tokyo municipality. For several years past the number of electric lights and power supply has been increasing at a rate of 15 per cent. a year. The capacity of the Tokyo Electric Light Co. and the municipal electric bureau, too, has been proportionately extended, accordingly.

At the end of August, 1923, the Tokyo Electric Light Company was supplying current for 3,180,202 lights in and around the city of Tokyo, and the municipal electric bureau for 721,900 lights, a total of 3,902,102, which decreased to 2,153,815, as will be seen in the following table :—

Comparison of Electric Lights in the Tokyo District Before and After the Earthquake, and the Recent Recovery.

Months	Tokyo Dento	Denki-kyoku
End of Aug. (1923)	3,180,202	721,900
Immediately after quake	1,587,015	566,800
End of Sept.	1,589,508	572,060
Do. Oct.	1,637,056	597,884
Do. Nov.	1,845,941	613,158
Do. Dec.	1,953,289	641,520
Do. Jan. (1924)	2,090,046	654,593
Do. Feb.	2,173,379	663,910
Do. March	2,244,639	678,084
Do. April	2,326,567	691,663
Do. May	2,370,433	702,676

The number of lights has registered a steady increase, reaching 3,073,109 at the end of May, 1924, a decrease of 900,000 lights in round figures.

On looking over the foregoing table, one finds that the decrease in the number of lights furnished by the Tokyo Electric Light Co., is considerably larger than that of the Tokyo municipal electric bureau in percentage, due mainly to the fact that the company had a large number of down-town customers, while the electric bureau had been furnishing more light in the residential districts, where the damage was not half so severe.

The aggregate total supply of the electric power in and around the city of Tokyo amounted to 248,406 k.w., at the end of August, 1924, dropping to 166,641 k.w., immediately after the quake. The Tokyo Electric Light Company lost about 80,000 k.w., and the Tokyo municipal electric bureau, about 100,000 k.w. but as in the electric light supply, the power consumption has also developed a steady increase.

Electric Power Consumption

Months	Tokyo Dento	Denki-kyoku
End of Aug., 1923	222,010 k.w.	26,396 k.w.
Immediately after the earthquake	149,776	16,865
End of Sept.	149,837	16,774
Do. Oct.	150,928	17,056
Do. Nov.	155,884	17,502
Do. Dec.	167,438	19,190
Do. Jan., 1924	178,288	20,355
Do. Feb.	186,599	21,514
Do. March	193,931	21,558
Do. April	199,910	22,157
Do. May	206,740	22,856

In the electric power supply, the Tokyo Electric Light Co., Ltd., has recovered 80 per cent., and the electric bureau about 70 per cent. The generating capacity of both sources of supply having been restored to pre-quake conditions, the consumption is expected to reach former conditions before the end of this year.

The Tokyo Electric Light Company is now erecting an electric bulb factory at Osaki-machi, a suburb of Tokyo, to be completed some time this autumn, that will turn out 2,000,000 electric bulbs annually. This, together with the 1,000,000 bulbs produced annually at the Honjo factory of the company, will be sufficient to cover the annual demand of the company.

The Tokyo Electric Light Company has been receiving its entire supply of bulbs from several companies, but since the opening of the Honjo factory, has been nearly able to meet its own requirements.

It is announced that the Bombay Port Trust have accepted the tender of Sir. W. G. Armstrong Whitworth & Co., Ltd., for a steel floating caisson for the entrance to the Merewether Dry Dock, Bombay. The caisson will be constructed at the firm's Walker Shipyard, Newcastle-on-Tyne.

A New Super-Power Development in Japan

Two 160,000 K.W. Plants for the Shinano River District

The 39,000 K.W. Station of the Shin-yetsu Electric Power Company on the Nakatsu River

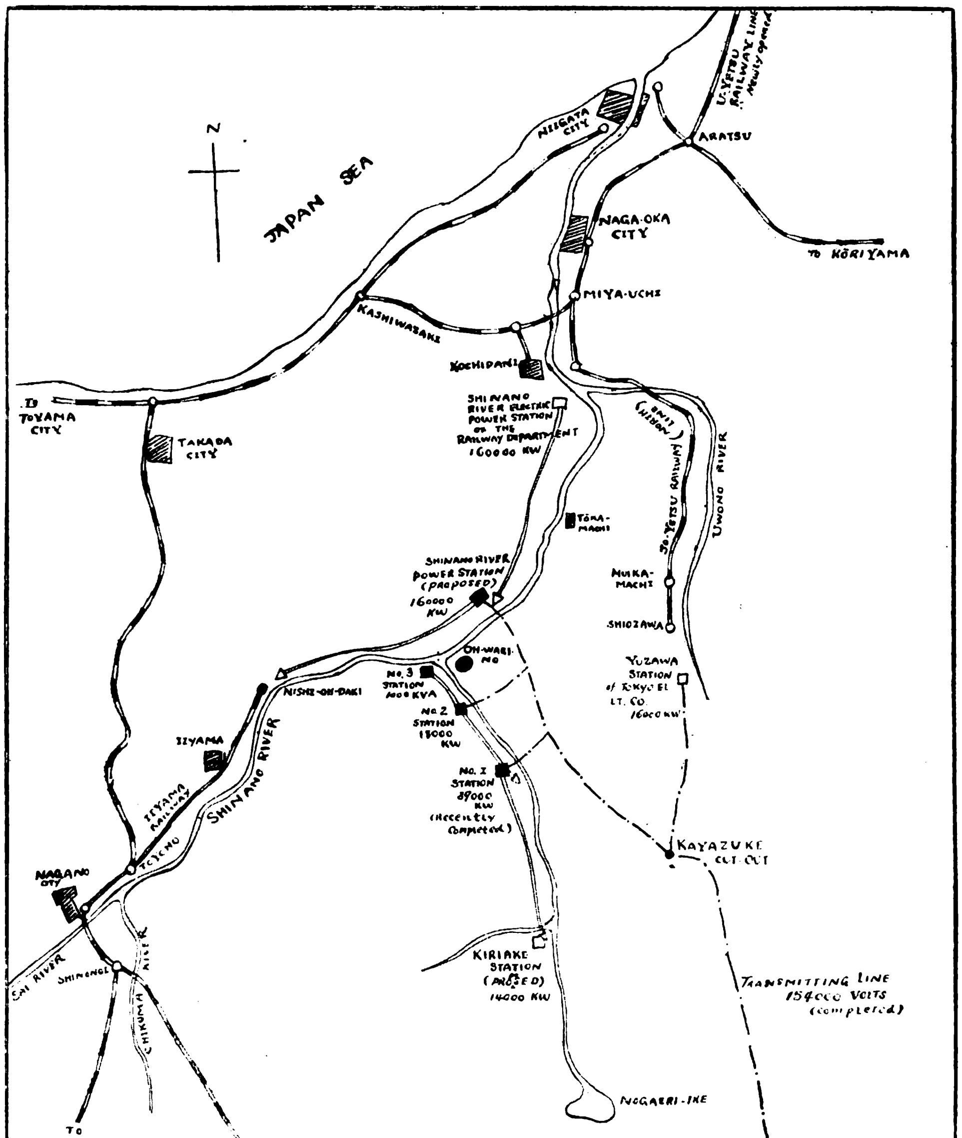
*By T. Kokubo, Bachelor of Engineering**

NESTLING in the bosom of the Japanese Alps lie the prefectures of Shinano and Hida, through the centre of which flows the Shinano River with its many tributaries forming the drainage system for a catchment area of over 5,000 square miles. Here are located many hydro-electric plants furnishing light and power to the neighboring towns and villages and here also have come the important Tokyo electrical companies seeking sites for plants that will supply the ever increasing power demands for the growing industries and transportation needs of the capital. In this district will be erected two of the greatest power plants in Asia ; one for the Shin-yetsu Electric Power Company and the other for the imperial government railway department, both plants to be 160,000 k.w. capacity. Although it is too early to say much about these super-power plants the plans for the Shin-yetsu plant on the Shinano River provide for a head race 13 miles long, delivering a volume of 6,700 cubic *shaku* under a 352 *shaku* (350 feet) head. Amongst the plants now in operation which merit special attention are the two owned by the Shin-yetsu Electric Power Company and located on the Nakatsu River, a tributary of the Shinano.

Two years ago, this company completed and placed in operation its No. 2 plant of 18,000 k.w. capacity and in August (1922) started work on the No. 1 plant, higher up the gorge of the same river. The site was in very difficult country presenting some of the most trying engineering problems yet encountered in hydro-electric work in Japan. The river valley at this point narrows down and is walled in by precipitous cliffs, making transportation of heavy machinery and construction material a never ending source of trouble. Nearly every conceivable method of transportation and carriage were resorted to in overcoming these obstacles and getting the materials on the job. The No. 2 power house of the company was called upon to furnish the current necessary for carrying out this work. At the time of the earthquake of last year the work on the No. 1 plant was nearing completion but with the sudden decrease in the demand for current from Tokyo it slowed down. Upon the melting of the winter snows this spring, work was again resumed and on June 21 the water was turned on and the first trial runs made. After being inspected and passed by the electrical bureau of the department of communications the plant commenced to operate commercially from the first of August last, augmenting considerably the distributing capacity of the Tokyo Electric Light Company.

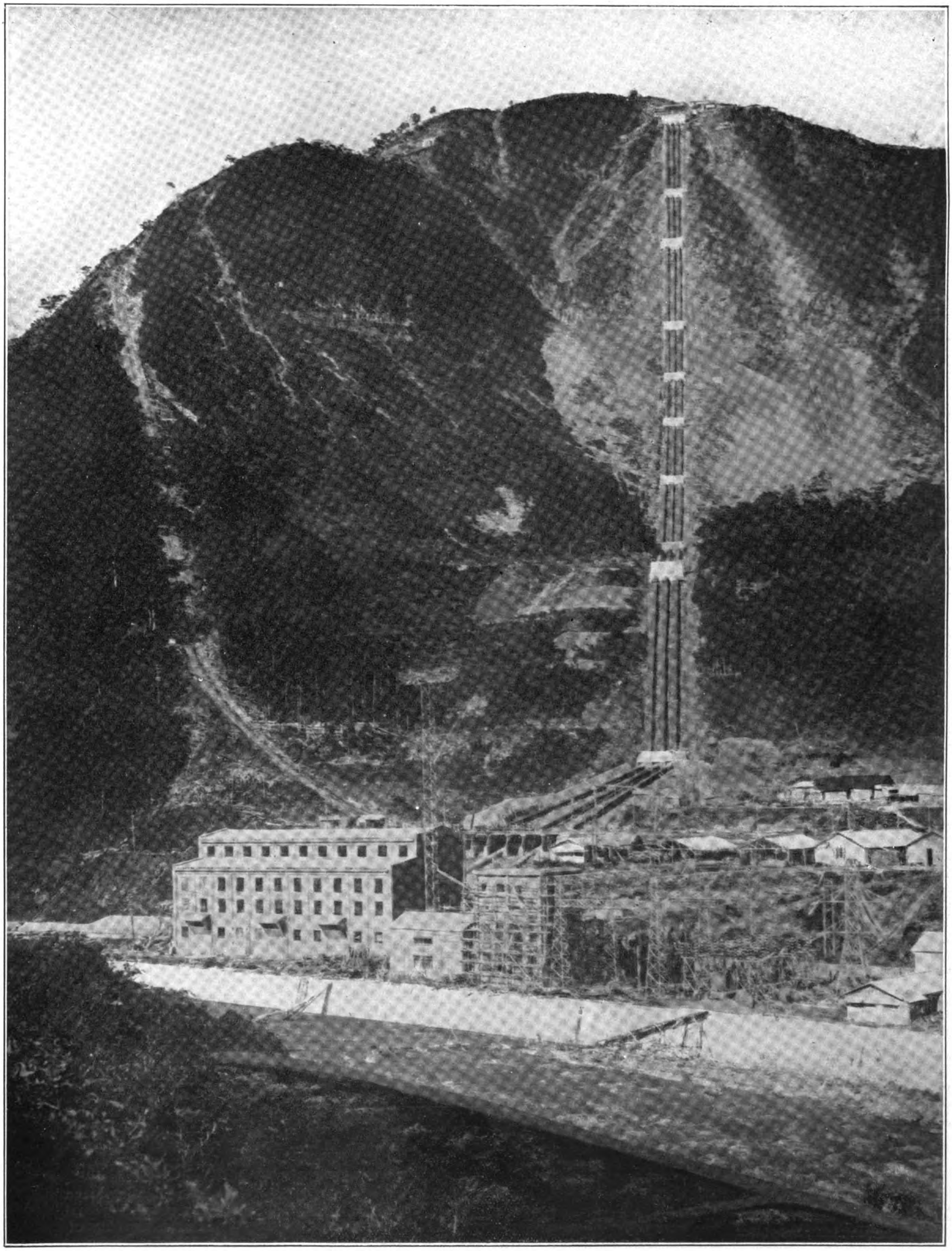
The location of the three power houses being in a district covered with snow to a depth of ten feet from November to May, the difficulties of transportation were enormous. More than one hundred thousand tons of machinery and materials had to be transported from the rail head. It was first necessary, however, to complete the Iiyama railway in great haste and utilize as far as possible the river. In this work alone more than 300 specially constructed lighters were placed in use and men skilled in handling boats in rapids brought from other parts of the country. These boats and lighters will be employed in transporting much of the material for the greater plant to be erected a few miles lower down the river.

To facilitate the progress of the work, the government railway department built a branch from the main Joyetsu line to Tokamachi. The Iiyama Railway Company is to supplement this by building a line 25 miles long connecting Tokamachi with Nishi-o-daki (its present terminus) which will pass through the site of the projected super-power plant of the Shin-yetsu Electric Power Company. The progress on this and the super-plant of the railway department will depend largely on the construction of this railway extension. The Iiyama railway from Toyono to Nishi-no-daki, a distance of 25 miles, primarily intended to develop the district of Iiyama was capitalized at Y.600,000, but when the Shin-yetsu Electric Power Company started to develop the water power of



Map of the Shinano and Nakatsu River District showing the power house sites of the Shin-yetsu Electric Power Company and the sites for the two 160.000 k.w. plants projected on the Shinano River

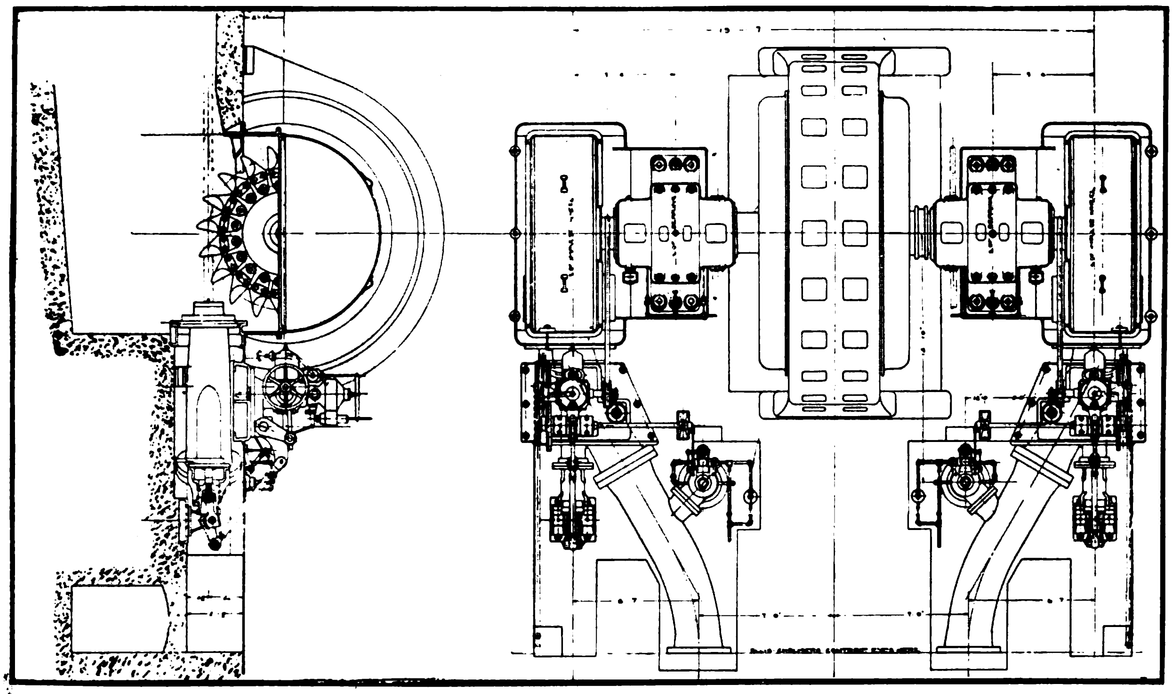
* Translated from "Ohm-sha."



No. 1 Power House of the Shin-yetsu Electric Power Co., Ltd. located on the Makatsu River. The picture shows the inclined railway track at the left, up which all materials were hoisted by electrically driven winches

the Nagano River the capital was raised to Y· 10,000,000, the majority stock being acquired by the electric company.

From Nishi-o-daki, the present rail head, it is one hour by motor bus to Owarino, where the No. 2 and No. 3 power houses and the head office of the Shin-yetsu Electric Power Company are located. From this point, where the Nagano empties into the Shinano, to the site of the No. 1 power house, the distance is about 2 *ri* (5 miles) and is covered by an electric tramway laid for construction purposes. Up to this point the transportation problem was more or less easily handled, but from the power house up the mountain to the intake (3,000 feet above sea-level) along 13 miles of cuts, canals and tunnels, the traveling was exceptionally difficult. At the intake a new power plant to be called the Kiriake station, with a capacity of 14,000 k.w., is projected. Further up the mountain at the source of the river (Nogaeri-ike) a scheme is materializing for the construction of a reservoir that will hold 500,000,000 cubic feet of water to provide against any low water emergency for the power houses along the Nagano River.



Type of Allis-Chalmers Horizontal Impulse Wheel installed in the No. 1 Power House of the Shin-yetsu Electric Power Co.

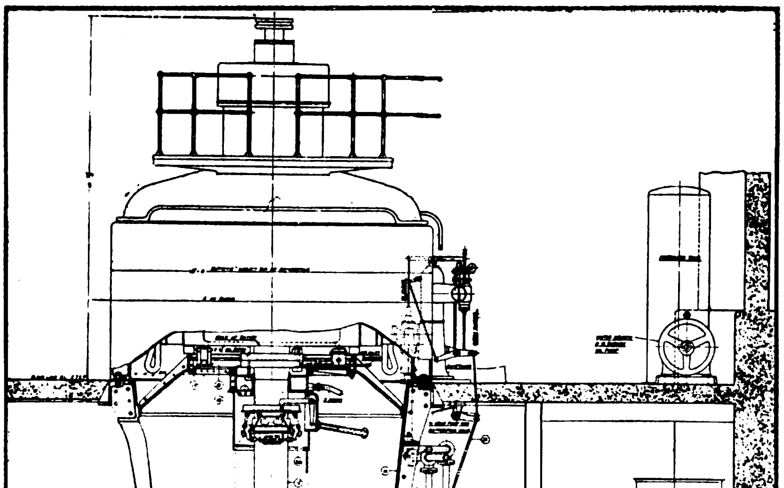
No. 2 Power House

In building the No. 2 power house a small hydro-electric plant of 700 k.w. capacity was first installed in order to furnish power for construction work and supply lighting to the adjacent villages. This power enabled the work to proceed rapidly and was used for operating the tramway, electric drills, sand-diggers and excavators, winches, pumps, concrete mixers, rock crushers, repair shop and the many other motors used in tunnel driving, construction and erection work. Owing to the liberal use of this cheap power the No. 2 power house of steel and concrete construction was completed within one year despite the fact that for four months the work was thickly covered with snow.

The current generated at the No. 2 power house is boosted from 11,000 volts up to 66,000 at the open-air transformer station of the Tokyo Electric Light Company and together with the current from the power houses at Yuzawa, Komatsu, Iwamuro and others, is transmitted to the Kameido transformer station at Tokyo, a distance of 127 miles. The capacity of the plant is 18,000 k.w.

The effective head of water is about 560 *shaku* (557 feet) with a flow of 500 cubic *shaku* per second. There are two Allis-Chalmers Francis water wheels of 13,000 h.p. each working at 600 r.p.m. direct connected to two General Electric generators of 10,000 k.v.a. each, 11,000 volts, 50 cycles. The switchboard instruments and appliances are from the Westinghouse Electric Manufacturing Company. There are four open-air transformer stations (one in reserve) each of 6,700 k.v.a. capacity, single phase where the first pressure of 11,000 volts is stepped up to 89,000 volts (with 66,000 taps). With star connections this pressure is still further boosted to 154,000 volts.

The water supply for this power house passes through a tunnel two *ri* in length fed from a regulating reservoir with an effective depth of 8 feet and a capacity of 2,430,000 cubic *shaku*. The normal flow is 350 cu. *shaku* per second and with the maximun flow of 500 cu. *shaku* per second the reservoir will supply the plant for a continuous run at its full capacity of 18,000 k.w. for 4½ hours. A special feature of this plant is a rolling head gate.



Type of Francis Water Wheel built by the Allis-Chalmers Mfg. Co. installed in No. 2 Power Plant of the Shin-yetsu Electric Power Co.

No. 1 Power House

The new power house just completed is located at a point 120 yards below the intake to the No. 2 plant in order that its used water may raise the volume of the river water which flows through the head race of the No. 2 plant.

The control dam in the main river at the intake is 100 feet long with an additional dam 50 feet long across the branch stream which flows into it at this point. The headgate is of the rolling type 40 feet in length by 5 feet in diameter. The head race is 20,900 yards long with a gradient of 1-1,250. Almost all of this is tunnel work which covers 19,649 yards, the rest being covered ditch. The regulating tank has an effective capacity of 2,500,000 cubic *shaku* with an effective depth of 8.7-ft.

The flume pipes are three in number arched and lap riveted. The total length is 2,697 feet with a diameter at the top of 5 feet and a thickness of $\frac{3}{8}$ inch increasing to $1\frac{13}{16}$ inches at the lowest part where the diameter of the pipe reduces to $3\frac{1}{2}$-ft. These come together in a Y, the ends of which taper off to the sluice gate valves. The total weight of these pipes is 2,200 tons and were supplied by the Kellogg Conpany of America.

The power house building has a total area of 1,124 square yards with 748 square yards devoted to the turbine and generating room. There are also three smaller houses 3 by 94 *tsubo*. The generating room is equipped with an Hidatchi overhead traveling crane 38-ft. long with a lifting capacity of 55 tons. There are three motors 80, 30 and 10 h.p. respectively, with a speed of 8-ft. in winding, 75-ft. in longitudinal and 35-ft. latitudinal movement per minute.

The generating equipment consists of three Allis-Chalmers horizontal axis impulse water wheels with overhung single jets and independent control developing 18,000 h.p. at 3,000 r.p.m. with a specific speed of 3.43. These are direct connected to three General Electric generators, rated at 14,444 k.v.a. three-phase, 50 cycles, 11,000 volts, with a rated efficiency of 97.2 at full load, 96.6 at three-quarter load and 95.6 at half load. A Westinghouse power regulator of the broad range type is also installed. The 235 k.w. 250 volt General Electric exciter is driven by a 400 h.p. impulse wheel at 985 r.p.m. manufactured by the Dengyosha Company.

The auxiliary equipment of the power house consists of three station transformers of which two are three-phase 100 k.v.a., 11,000 volts—220 and 110 volts and one three-phase 350 k.v.a. transformer 11,000—3,300 volts. There are two 5 k.w., 220 volt generators operated by electric motors for charging the accumulator which has a capacity of 100 amp. hours, 220 volts, discharging in three hours : two 15 h.p. motors for the oil pump attached the speed regulator : one 3 h.p. motor for the air compressor attached to the oil tank of the speed regulators : two 25 h.p. motor-driven cooling water pumps. One set of the above equipment is for reserve purposes. The open-air transformer is furnished by the Tokyo Electric Light Company and is provided with four (one in reserve) single-phase oil transformers, 15,000 k.v.a. manufactured by the General Electric Company. The first pressure of 11,000 volts is stepped up to 89,000 volts and with star connections it produces 154,000 volts. The cooling water comes from the reservoir supplied by the motor-driven cooling pumps.

The difficulties surrounding the construction of the No. 1 power house were trying in the extreme, especially in the transport of materials from the power house site to the head tank. Up this incline a winding track had to be built with the cars hauled up by winches operated by motors. One of these motors of 550 h.p. operated a winch which raised a load of 50 tons and another of 300 h.p. operated another winch raising 25 tons. Several special motors were also used to raise loads of ten tons in laying the iron pipes in the head flume. In addition, a tramway line 13 miles long (2′6″ gauge) was laid from the entrance of the gorge to the power house site on which 24 electric locomotives were in constant operation.

One of the features of this construction job was the two huge stone-crushing plants operated by electricity and equipped with 200 h.p. crushers which had to be erected to supply the work. As the river bottom could not furnish the large amounts of gravel and sand required for concrete mixing, a side of the mountain was blasted out to provide material that was crushed to dust and the screenings used as a substitute for sand and gravel. Over 8,000-lbs. of blasting powder were used in two blasts and over Yen 500,000 expended on the crushing plants alone.

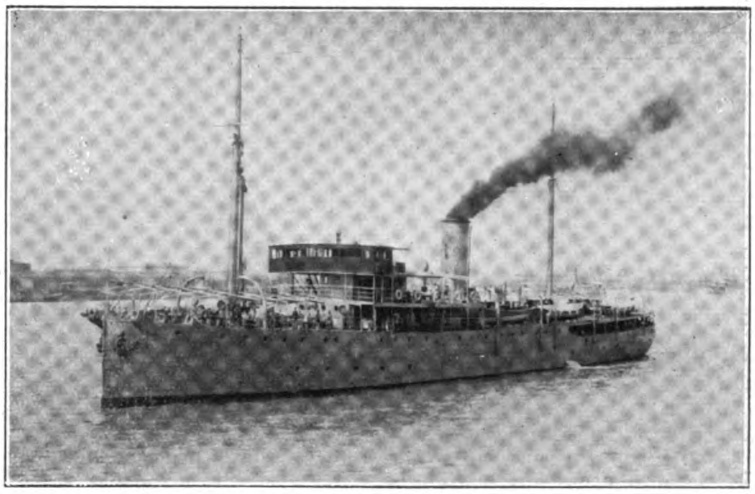
The highest head of water in Japan (1,980 *shaku*, effective, 1,850 *shaku*) is used at the power plant of the Besshi copper mine (owned by the Sumitomo company) but the capacity of the power plant is only 4,000 k.w. Compared with this, the head of water at the No. 1 power house of the Shin-yetsu company generating more than 200,000 k.w. is the most powerful in Japan. The difficulties in laying the pressure pipe under these conditions were unparalled in Japan. At one place it was necessary to lay the pipe at an angle of 50 degrees during which one engineer was killed and several workmen injured.

Interest in this plant has not ceased wtih its completion as there still remain difficulties that must be met and solved in order to assure its safety and operation during the winter months. Then all the drainage channels in the catchment basin will be blocked with snow and a continued snow-fall may start an avalanche that might block the head entrance. Again, the districts over which the transmission line passes are covered deep with snow during the winter months and the transmission of a 150,000 volt current through this snow-covered territory will be watched with the greatest interest as it is the first time it has been attempted in Japan.

New Customs Cruiser "Hai Hsing"

THE New Engineering & Shipbuilding Works, Limited recently launched a new cruiser for the Maritime Customs at their yards in Shanghai. The vessel attained a speed of 13 knots on its trial trip and in every way met the requirements of the specifications.

The vessel is of the combined bridge and forecastle type, having straight stem and cruiser stern built of steel in accordance with the classification rules of Lloyds for 100 Al. The hull is divided longitudinally into eight water-tight compartments, with three steel decks, an upper bridge deck, navigation bridge and flying bridge deck. With two masts and a single funnel the vessel presents a very smart appearance. Ample cabin accommodation for the captain is arranged on the upper bridge deck and on the combined forecastle and bridge deck there are comfortable quarters for the deck and engineer officers.



The Customs Cruiser "Hai Hsing"

The upper deck are fitted for the accommodation of foreign lightkeepers and Chinese crew, with spaces for spare cabins, bathrooms, lightkeeper's mess room, sick bay, armoury, etc.

Powerful Machinery

The deck machinery comprises :—A powerful steam windlass on the forecastle deck specially designed for handling various sizes of buoy chains and cables. On the forward and aft side of the foremast is fitted a 5-ton winch, one to serve the 10-ton buoy davit and the after winch for handling 15 tons lifts in conjunction with a steel derrick. A one-ton steam capstan is fitted on the upper deck aft for warping purposes. The propelling machinery consists of two sets of triple-expansion, surface-condensing engines, having inverted cylinders and three cranks placed in line directly over the crank shaft, designed to be entirely independent for propelling purposes. All pumps are driven direct by separate engines. Steam is supplied at 190-lb. per sq. inch.

A Cochrane donkey boiler is installed for use in port and a very complete set of engine room auxiliaries of the latest type is provided for the special duties to be carried out on board. The engineers' workshop requires special mention, being fitted with lathes, shaper, drills and grinder, all electrically driven and provided with accessories with which repairs to the machinery on board and on the stations can be handled when required.

Electric light is installed throughout the vessel and a Marconi wireless outfit of the latest type completes the list of special equipment.

The dimensions of the *Hai Hsing* are as follows :

Length overall, 260′0″ ; length B. P., 250′0″ ; breadth moulded, 28′0″ ; depth moulded to upper deck, 21′0″.

The Electric Home in Japan

A Vast Field for the Merchandising of Electrical Appliances

AN electric exhibit was recently held at the Mitsukoshi department store in Tokyo in which a fully equipped electric home of two stories was erected having one-half the rooms furnished according to Japanese methods and the other half in accordance with the most up-to-date western ideas. The foreign half of the house was equipped throughout with modern electric light fixtures, electric fans, portable lamps, electric kitchen, irons, and the many other household conveniences so popular in other countries. This exhibit was held under the auspices of a society headed by Viscount Goto in which all the Japanese and most of the foreign manufacturers of electrical appliances participated. The widespread use of cheap electric power in Japan has produced a decided tendency on the part of the people to use electric household appliances and the exhibit was designed to develop more rapidly this field of electric merchandising and at the same time diminish fire risks by supplanting the old Japanese charcoal heaters, the most frequent cause of conflagrations.

In discussing this new tendency, Mr. I. W. Baker, representative of the Westinghouse International Electric Company in Japan, precedes a most interesting report on electric merchandising in that country by the statement that "*Japan has staked her future on the development of her greatest national resource, water power. Before many years, this nation will be the most perfected example of a completely electrified country.*" He then proceeds to say that in the past, electrical merchandising in Japan has received very little consideration. Lately, however, the subject has been given much thought and Japan will shortly experience a big boom in the use of electrical appliances.

This condition does not exist on the other electric devices for lighting, railway and industrial power, which have developed steadily since the first bipolar motors were installed in the nineties by the Tokio Electric Light Company. Conservatism reigned for twenty years, but the rate of growth of these electric services during the past ten years probably has been exceeded in no other country. The demand in Tokio doubles every five years.

Although the power companies are expanding as rapidly as possible to take care of the needs of the communities which they serve, they have barely been able to keep abreast of the demand for electric lighting and power. Therefore, they have not carried out many campaigns for the installation of electric heating and cooking appliances, even though the demand for these appliances exists.

The importance of these needs can be realized by recalling that Japan is second only to the United States in the number of homes wired for electricity. The power stations of Japan have a connected service to twenty-three million people, which is more than the combined electrical users of the rest of the world excluding only the States. Ultimately every home in Japan will be electrified as the increasing shortage of kerosene, coal, charcoal and wood will make them a luxury. Even at the present time the fact that electric heat can be purchased on a sliding scale reaching 2.6 sen (1.3 cents) a kilowatt-hour when the monthly consumption exceeds 600 kilowatt-hours is causing dealers in soft coal retailing at 60 yen ($30.00) a ton, considerable apprehension.

It is expected that the coal supply of Japan will be exhausted in fifty years. However, by this time the eight milllion kilowatts of white coal, which are economically applicable, will have been developed for meeting most of the demands now fulfilled by coal.

One of the most progressive central stations in Japan in regard to merchandising is that of the Kioto Electric Light Company which follows the modern method in their endeavor to load up the power lines with profitable load from home appliances. Low prices are quoted on all appliances, and in many cases the partial payment plan is allowed. Special monthly rates are given for users of cozy glow and similar air heating devices. This company maintains a show room in which constant demonstrations are in progress, educating the people in the use of electric appliances. It is stated that this show room is conducted at a considerable loss to the company, as the profits from the sale of goods fall far behind the running expenses. However, it is expected that the benefits which will result in the future from loading up the power lines will compensate for all such present losses.

Another field receiving special attention is that of the Tokio district which is supplied by the Tokio Electric Light Company. The merchandising situation here is probably the most developed of any city in Japan. There are numerous dealers handling electric appliances, and the people of Tokio are in general well acquainted with the advantages of the use of electric current. Perhaps the greatest single obstacle to the sale of electric appliances has been the lack of day current which has been supplied only during the hot months of July and August.

It has been impossible in the past for the central station to build power plants fast enough to keep up with the night demand, not taking into consideration the supplying of day power in the colder months when water was scarce in the hydro-electric plants. However, by an amalgamation of practically all companies within 200 miles of Tokio, coupled with judicious financing operations, the power supply has been raised to 300,000 kw. Furthermore, in two years the supply will be 600,000 kw. which includes a 100,000 kw. steam plant.

In anticipation of this plentiful supply which will permit a twenty-four hour service, the Tokio Electric Light Company is planning an active merchandising campaign to load up its lines. Heating appliances and irons will be rented or sold on the installment plan. Motor-driven appliances will be tested and recommended to the public.

The recent expansion of power supply in the Osaka district of Japan has greatly stimulated the efforts of dealers and commercial departments of central stations in that locality. One dealer has a five-story building entirely devoted to exhibits of electrical material. Model kitchens are shown of the different sizes to suit any type of Japanese home. In smaller kitchens the electric features are confined mainly to a two kw. hot plate equipped with an aluminium pot for cooking rice. The more elaborate outfits include such items as a 3-19-B range, electric washing machine, dish washer and hot water tank equipped with bayonet heater and thermostat.

The Osaka district has not been so plentifully supplied with power in the past, but the recent water power developments by the Nippon Electric Power Company, Daido Electric Power Company and the Ujigawa Electric Company will increase the supply from 150,000 kw. to 450,000 kw. Also, the steam station supply will be increased from 150,000 kw. to 300,000 kw. These will provide for peak loads or shortages in the water supply.

In carrying out the electric idea in Japan, the path of least resistance has been followed by some local manufacturers who are attaching resistance coils to heating appliances in common use which ordinarily are adapted for charcoal. For example, the charcoal brazier or *hibachi* has been electrified, the replacement being carried so far that the coil is concealed in a piece of imitation charcoal made of cast iron. Another clever adaptation occurs in the Japanese sad iron. This is a small iron weighing less than a pound and it is equipped with a long handle for smoothing seams. The smoothing of cloth with a hot iron is a western idea, as in Japan this has always been done by stretching the cloth when wet on a board and letting the sun do the rest. Of course, such a process is slow and troublesome and with the shortage of household labor a quicker method must be used. For any heavy smoothing work the small Japanese iron is being superseded by the three and six-pound irons which are being built in large quantities by local makers. The three-pound electric iron meets with greater favor at present, primarily because it does not blow fuses when installed in ordinary lamp circuits.

Another local heating appliance is the rice cooker which is nothing more nor less than a one or two kw. hotplate with suitable brackets for supporting a rice kettle over the coils. It has been found by test with a Westinghouse 2-19-B range that rice can be cooked very cheaply and quickly in the oven which works on the fireless cooker principle. It is expected, therefore, that revolutionary methods of cooking rice will be adopted by the new generation, with the aid of electricity.

A great deal is expected from the use of electric heat in the home. This would not be expensive as it is not customary to heat a house or even a room to seventy degrees. What is desired is a clean, simple form of heater. The winters in Japan are short and the temperature rarely falls to 0° F., hence, an air heater or cozy glow of one-half to one kw. is quite sufficient for a room. At present this local heat is supplied from *hibachi* which require replenishing and cleaning and in addition throw oft fumes causing illness and even death. Another disadvantage lies in the fire risk. It is not uncommon for 300 to 400 houses to burn following some accident to one of these charcoal stoves.

The great earthquake and fire in Tokio and Yokohama of September 1, 1923, was no doubt started in many places by these crude open fires. One of the important points which had considerable to do with the widespread destruction, was the multiplicity of places where these fires started. Fire seemed to break out in every quarter and the large number of conflagrations were no doubt largely started by the *hibachi*. If electric heat had been more universally in use, it is certain that the fires would have been less numerous. The great disaster, of course, destroyed vast amounts of electrical appliances, all of which will be replaced, and many more added.

To prepare for this great demand, the local manufacturers of such equipment and the importers of foreign-made equipment are enlarging their facilities and stocks and soliciting business diligently, all of which will tend to increase the sale and demand to higher standards than existed prior to the earthquake.

Other examples might be cited of the benefits that Japan will derive from the more universal use of electric appliances, but sufficient has been shown to illustrate that this nation, which has staked her future on the development of her greatest natural resource, water power, before many years will be the most perfected example of a completely electrified country. The same super-power system which drives the express trains will supply light and heat to the homes, and cook the food of the nation.

Britain Invents New Shipbuilding Steel

THE production of a new mild steel for shipbuilding purposes, which has just been announced in England, is of the greatest interest and importance. It is being applied in the construction of two new vessels of the Blue Funnel Line (Holt & Co., Ltd.), destined for Far Eastern trade.

The chief claim for the material is that the plates of the vessels may be made considerably thinner and yet retain the same strength as the plates ordinarily used, and thus it will be possible to build a vessel of given size lighter—any yet able to carry a considerably heavier cargo, with the same engine horse-power.

By the use of this steel a saving of 8.50 per cent. in weight of material will be made, but neither the strength nor the efficiency of the vessel will be reduced in the slightest degree.

The invention, which is causing a great amount of comment in the British metallurgical world, and is being also almost equally discussed in similar circles in the United States, is like so many new and great discoveries, the direct result of an accident. It is the emanation of the brain of F. G. Martin, chief chemist and metallurgist at the head office of the Blue Funnel Line, in Liverpool. Mr. Martin has had the idea in mind ever since the stranding of the Blue Funnel liner *Aeneas* in 1916. He at once proceeded to the scene of the disaster and after testing the plates, used in the construction of the stranded vessel, came to the conclusion that their true elastic limit was, in most cases, too low; the elastic limit being the point to which the plates would stretch and yet return to normal.

In the case of the *Aeneas*, such limit was found to be only 3 tons to the square inch. Mr. Martin became obsessed with the idea that were the elasticity increased to say, 12 tons per square inch the weight of the material would be correspondingly reduced.

On account of the war, it was impossible at that time to do any practical experimenting, and consequently the idea remained in abeyance until 1918. Just at that time a machine was invented by Professor Dalby of London, which materially assisted matters, as it was designed to accurately and rapidly record the elastic limits. This proved the true elastic limit to be approximately 8 tons per sq. in.

Aided by this invention Mr. Martin immediately got in touch with a firm of practical steel makers—David Colville and Sons of Motherwell, Scotland, and between them they evolved a quality of mild steel, which would pass all the required shipbuilding tests and yet provide a higher elastic limit than any previously in use.

The direct result has been, as above stated, the placement of an order for two new vessels which are now in course of construction, in co-operation with the board of trade and all the classification societies, who are insistent on the new steel being thoroughly demonstrated before making any further concessions, since the possibility of Making further increased savings over the 8.50 per cent. already permitted, is the scantlings, is already under discussion.

The vessels, which are being built at Greenock, Scotland, are for the firm's cargo trade, and are 425 feet in length.

The saving of 8.50 per cent. is equivalent to 250 tons in weight, and also adds that amount of space to the vessel's carrying capacity, thus materially increasing the vessel's revenue when full cargoes are carried.

The question of cost is, of course, an all important one. It works out at between 2 and 3 per cent. greater than that of a vessel constructed of ordinary steel, due to the increased manufacturing costs. The compensating advantages, however, are great, and consist of the additional carrying capacity on the same draft and horse-power for the same speed.

Under normal conditions these vessels will be in a class by themselves, and more profitable than any others of similar size and design yet constructed.

The ultimate results are being anticipated with the utmost confidence, and, if successful, as is believed will be the case, expert authorities predict a revolution both in the shipbuilding and the shipping industries.

A Wicked Canard Scotched

It will be recalled that a report was recently published, to which some newspapers attached flaming headlines, stating that Japan had ordered 140,000 machine guns from the British Vickers Company. The editor of the *Boston News Bureau* sought confirmation of the report and under date of August 22 received a personal letter which he asserts came from " the highest possible quarters in the world." The writer declares that " Japan has not ordered one single machine-gun," and adds: " It is evident that your papers keep the Japanese fire going by always using the bellows."

The sensationalist who concocts and broadcasts a canard like the one referred to, commits a crime against civilization. He is even lower in morality and mentality than the youthful murderers of the Franks boy, whose only explanation for their act was that they " wanted a thrill."—*The Pittsburg Times.*

The Yue Tung Flour Mill at Shanghai

(Continued from page 548.)

carefully planned system of dust collectors from the danger of dust explosions that occur so frequently in flouring mills.

Outside of the machinery, every device that would help to reduce the manual labor required and economize in the consumption of power has been adopted and it is estimated that flour is being produced in the mill on a basis of 3.75 barrels per horse-power hour.

While it is next to impossible, owing to the variations and market conditions in this class of construction, to arrive at a safe cost basis, an approximate commonly used for establishments of the size of the plant described, including building, power and equipment all installed, is $160 per barrel. This is based on the cost of construction in the United States. For foreign work a considerable addition would have to be made to this figure, although in some countires this would again be offset by the lower price paid for labor.

Telephone Reconstruction in Japan

TOKYO'S telephone system, all but wiped out in the earthquake and fire of a year ago, will not be restored to its pre-quake basis for another year and a half according to present estimates of the officials of the department of communications.

There were approximately 85,000 telephone subscribers in the capital before the quake and now there are only about half that number of instruments restored. By April of this year, 64,000 telephones were in use and the installation of 24,000 automatic instruments (the contract for which has been let to an English concern) is now taking place.

A glance at the statistics of the earthquake and fire losses sustained by the telephone system will give an idea of the enormity of the task confronting the department of communications a year ago. Out of a total of twenty telephone exchange offices in Tokyo, all but four were completely destroyed in the disaster and the equipment of the four surviving central offices was so badly damaged that it was not restored to use until a month after the catastrophe. Of these sixteen offices wiped out by quake and fire, six have been rebuilt or are nearing completion, being restored on their former sites. The new buildings are of fireproof construction and modern throughout. The rebuilding of the other ten exchanges, however, must await the consummation of land, readjustments in connection with permanent reconstruction. The damage to Tokyo's telephone system has been estimated at Y.150,000,000.

Ushigome telephone exchange building in Tokyo which was not destroyed by the quake or fire and is one of the most modern central offices in the Capital

At the first violent shock, every telephone in the city was useless and for four days following the disaster, not an instrument was restored to service. Five months after the quake, Tokyo had 18,000 telephones while Yokohama, which boasted 10,000 telephones before the catastrophe, had only 500 in service.

As an emergency measure, the telephone bureau had established by the end of January of this year, thirteen sub-stations in districts in Tokyo formerly served by regular exchange offices.

Any group of 200 former telephone subscribers urgently in need of telephones and living within a radius of a fifth of a mile of the site of a former central office, might apply for the installation of such a temporary substation. These temporary stations were operated at pre-quake telephone rates, each subscriber paying an initial fee of Y.300. Sixty-five such stations had been authorized by the first of this year but only thirteen installed.

A further temporary measure taken by the bureau was the establishment of fifteen booth telephones in different parts of the city, each equipped with messengers who would deliver a telephone call to any party living within one-third of a mile of the booth. Fifty such stations were authorized. The bureau also authorized the installation of 500 public telephone booths in different sections of Tokyo to accommodate former subscribers unable to obtain telephones. Of this number 348 had been installed up to October 1, 1924.

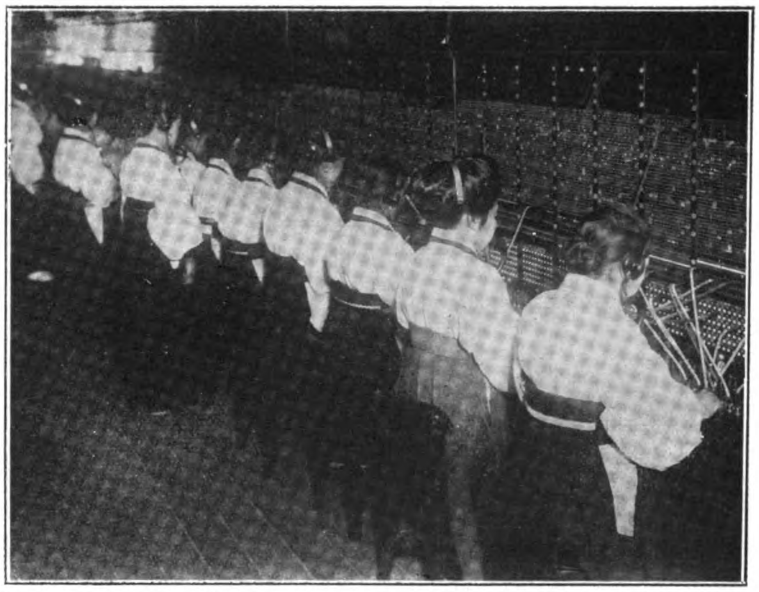
In Yokohama where business firms were clamoring for telephones and only 500 had been restored up to January 1, the department of communications granted the first permit ever issued in Japan for a private telephone exchange. In February, a group of 120 business men established a private exchange in Yokohama with telephone operators and six inspectors. The license was granted for three years with the understanding that it would not be renewed at its expiration.

Although the present shortage of telephones in Tokyo is to be attributed chiefly to the quake and fire of a year ago, there were 90,000 applications for telephones on file before the disaster which had not been granted This does not mean that there were than many firms in urgent need of telephones who were without them

Shiba telephone exchange, one of four central offices in Tokyo spared by the earthquake and fire

Aoyama telephone exchange in Tokyo, one of four surviving the quake and fire

for it was possible by an investment varying from Y.1,500 to Y.2,000 to purchase a telephone from a broker. Telephones are issued by the bureau by means of a lottery system. Each year the bureau granted about 5,000 new telephones and those fortunate enough to draw a lucky number received an instrument for which they only had to pay an installation fee of Y.500 instead of Y.2,000 necessary to buy an instrument from a telephone broker. A telephone is a lucrative investment as long as the bureau pursues the policy of issuing only only a limited number of new instruments each year.



Telephone switchboard in the Ushigome exchange in Tokyo with operators and supervisors at work

After a telephone is obtained, the subscriber must pay a fee of only Y.40 a year and two sen per call to maintain it. A special rate of one sen per call was allowed for a telephone installed in a newspaper building. When a telephone is granted to an individual, he may not dispose of it for a certain period, but at the expiration of this period he may sell it if he sees fit. Buying and selling telephones is a recognized occupation in Tokyo, the individuals thus employed being known as telephone brokers.

According to an American telephone expert connected with the Western Electric Company, the manual equipment used in most of the Tokyo exchanges before the quake was of up-to-date type, comparable to similar equipment used in the United States. The Japanese have patterned their telephone system largely after that of the United States, sending a group of their telephone experts to America every year to study the latest methods in use in the larger cities of the United States.

Japan's telephone system, as has been inferred, is owned and operated by the government, being administered by a telephone bureau appointed by the department of communications. Tfe officials in charge of the telephone system admit that many thousand more subscribers could be obtained if the telephone system could be expanded to accommodate them, but the insurmountable obstacle in the way of expansion is the diet's unwillingness to approve the appropriation of funds necessary to make the present system adequate for the true needs of the capital. The telephone business, far from returning a profit to the government, is a source of loss annually and as now conducted it is not possible to recover the deficit from subscribers' fees. Expansion of the system must come from newly invested capital, not from dividends. Since the system at present is not paying its way, the government is unwilling to promote a greater deficit by authorizing the expansion of the system on a large scale, when the strain on its coffers for reconstruction purposes is already at the bursting point.

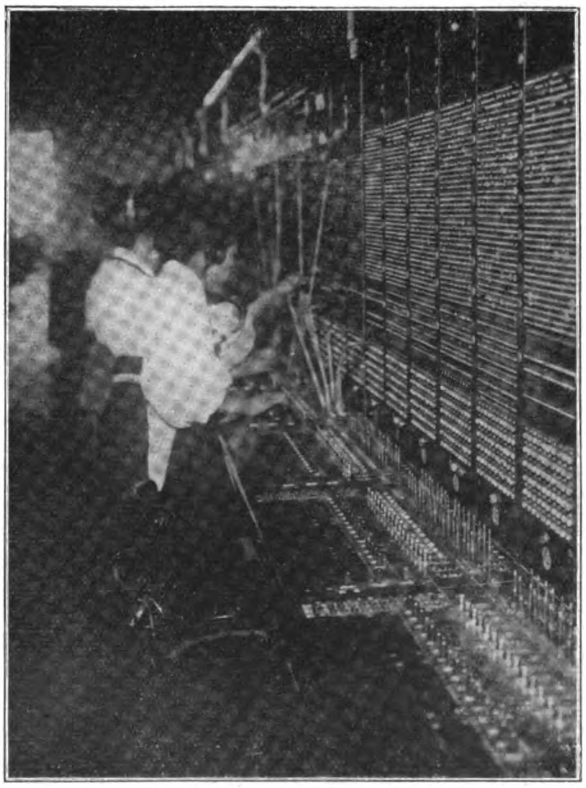
The equipment and methods used in a Japanese exchange are not unlike those of a modern telephone central office in the United States except that in most cases the operators are much younger than girls engaged in the same occupation in America. The average age of a telephone operator, according to an official in charge of Ushigome exchange, was 14 years before the quake,and them inimum age 13 years. Since the Japanese method of computing age differs from the Occidental custom of reckoning by sometimes as much as two years, depending on the month in which the individual is born, many of the operators are as young as 11 or 12 years according to the standards of English-speaking peoples.

All Japanese telephone operators in Tokyo are required to wear a uniform costume consisting of a sort of skirt called a "*hakama*," worn over a working kimono of coarse white cloth. The sleeves of this kimono are not as full as those of an ordinary kimono and are tied with a cord just below the elbow to prevent them from interfering with the movements of the operator's hands.

The qualification for a telephone operator in Tokyo is a primary school education. New operators are given three months' work in training quarters on a practice switchboard. Then they received one month practical training at a sub-station, after which they are sent to the residence exchange nearest to their home. After several months in a residence exchange, they are eligible to work in an exchange in the business district.

While in training, their wage is 84 sen per day. After they are placed in regular service, they receive 82 sen a day and a bonus of from Y. 3 to Y.4 every three months. The highest paid operators receive about Y.1.20 a day and a bonus of Y.15 every three months.

The operating rooms in Tokyo exchanges are well lighted, heated and ventilated. They are very comfortable in winter but in summer when the humidity in Japan is unusually high, every window in the exchanges must be closed at times, because the moisture in the atmosphere affects the mechanism of the switchboard. On the hottest days, large blocks of ice are sometimes distributed about the operating rooms to make the temperature more bearable.



Operators "standing" for a rest while at work at a swithchboard in Ushigome exchange. It has been found that a few minutes standing is beneficial to the operators though they sit down to their work most of the time

The Ushigome exchange, one of those of fireproof construction not destroyed a year ago, has a lunch room for operators on the second floor and a large dormitory on the first floor. The operators who begin work at 2 o'clock in the morning come to the exchange at o'clock in the evening and sleep in the dormitory until they are called to duty. The dormitory in this exchange will accommodate 80 girls. When the operators who finish their shift at 2 a.m. get off duty they sleep in the dormitory until morning when they return to their homes. The hour just preceding bedtime in these telephone exchange dormitories is looked forward to with great anticipation by these child operators who make it an occasion for playing games and various forms of recreation.

On the ground floor of the exchange is a large Japanese bath.

Compared with the efficiency and excellence of Japan's government owned, and operated railway system, government ownership of her telephone system is not an unqualified success.

Japan's Coal-tar Chemical Industry

THE coal-gas industry of Japan is the sole domestic source of crude coal-tar materials. In fact, it is because of the by-products such as coal tar, coke, and ammonia, that the gas industry, in competition with hydro-electric power, owes its existence. Approximately 500,000 *koku** of coke and 160,000 *koku** of coal tar are produced annually from the gas industry, which makes clear how essential it is that the coal-tar chemical industry be fostered. Hence, the government in its endeavor to propagate and protect this branch of the chemical industry, inaugurated a subsidy action June 21, 1915, embracing the manufacture of crudes, intermediates, dyes, drugs, and explosives.

As in many other countries, the manufacture of dyes is considered a " key industry " by Japan and has been subsidized for more than Y.9,500,000 in the past seven and one-half years. During the war Japan had over 100 factories engaged in this industry representing an investment of Y.20,000,000. During that period the government organized the Japan Dye Manufacturing Co., in Osaka, with a capital amounting to Y.8,000,000, with control exercised through the bureau of industry, department of agriculture and commerce, Tokyo, and the home production grew under the guardianship of the government. After the war the importation of foreign dyes became active again and the companies have been unable to make any profit, notwithstanding the high protective duty, and hence the government has been compelled to make good the loss. The Japanese concerns have been successful in their experiments with over 80 kinds of dyes. The majority (86 per cent. of the total) made by the Japanese are sulphur colors, particularly sulphur black, and these are her best colors. In fact, three or four of these sulphur dyes are of superior quality. Rhodamine, a few alizarines, direct, basic, and acid dyes of the primary color type are also produced.

In 1919, the peak year of production, it is estimated that the dye factories of Japan produced over 16,000,000 pounds of dyes. The factories suffered, however, from a lack of intermediates and a shortage of skilled workmen, although almost any common dye of commerce could be produced by the Japanese factories in their laboratories. They have been unable, however, to produce the higher and finer types of dyes in commercial quantities and at competitive prices. This condition, which has resulted in a flood of imported colors, has also been reflected by the decline in Japan's production figures. At the present time there are only two dye factories operating on a large scale in Japan—The Japan Dye Manufacturing Co., Osaka, and the Mitsui Mining Co. There are no figures available as to the quantity of crudes produced, but some indication may be arrived at on the basis of the quantity of coke and coal tar produced annually. In the case of intermediates, however, there is no indication as to the quantities produced, except that which might be estimated from a study of the amount of coal-tar dyes and drugs produced and the added information afforded by the country's exports and imports of crudes and related products. In both cases, however, Japan's production, particularly as to crudes, is inadequate to meet its demand.

The future of the entire coal-tar processing industry, as reflected by statistics and large financial loss, looks extremely dubious, yet the government considers it essential and, according to the Japanese press, will continue to foster, subsidize, protect, and furnish requisite technical assistance until the industry is independently established, at least in connection with basic processing.

An acknowledged condition such as this may offer opportunity to American manufacturers who are aggressive enough to cultivate the market in competition with other nationals. The market is steadily growing and the foreign product is obtaining a more extensive and more stable hold.

*The *koku* equals 47.95389 United States gallons, or 5.11902 United States bushels (dry). 93545—24——3.

JAPANESE DYE PRODUCTION

Classes	1921 *Kin*	1920 *Kin*	1919 *Kin*
Direct colors	299,871	209,304	421,521
Basic colors	350,195	275,452	245,115
Sulphide colors	8,002,195	5,034,535	10,682,836
Acid colors	90,048	109,340	155,336
Acid mordant colors	6,959	10,212	...
Mordant colors	128,544	65,017	...
Vat colors	72,909	200	...
Miscellaneous colors	579,623	356,614	945,034
Total	9,530,344	6,060,674	12,449,842

Note.—One *kin* equals 1.32277 pounds.

Exports

In 1921, the first year of record, Japan exported 49,000 piculs of coal-tar dyes (representing 5 per cent. of the total production), of which 48,653 piculs went to China. The total exports for 1922, however, dropped about 9,000 piculs. Coal tar and pitch exports rose from 46,000 piculs in 1919 to almost 89,000 piculs in 1922. China and the Dutch East Indies have been the principal purchasers. Most of the Japanese export of naphthaline goes to China. The coal-tar products situation has been fairly well outlined in the comments on Japanese production and imports.

JAPANESE EXPORT OF COAL-TAR PRODUCTS

Value

Classes	1922 Total 1,000 *yen*	1922 United States 1,000 *yen*	1921 Total 1,000 *yen*	1921 United States 1,000 *yen*	1920 Total 1,000 *yen*	1920 United States 1,000 *yen*	1919 Total 1,000 *yen*	1919 United States 1,000 *yen*
Coal-tar dyes	1,975	1	3,357	...	...	...	...	...
Coal tar and pitch ...	633	...	153	...	459	...	252	...
Naphthaline	57	...	65	...	300	157	217	...
Total	2,665	1	3,575	...	759	157	469	...

Quantity

Classes	Total* *Piculs*	United States *Piculs*	China and Kwantung *Piculs*	Hongkong *Piculs*	British India *Piculs*	Dutch East Indies *Piculs*	Straits Settlements *Piculs*
Coal-tar dyes :							
1922	40,358	...	...	...	...	...	...
1921	49,043	...	46,035	2,618	61	254	28
1920	...	...	...	...	...	...	...
1919	...	...	...	...	...	...	...
Coal tar and pitch :							
1922	88,926	...	...	...	...	...	...
1921	26,072	...	22,963	...	...	2,611	...
1920	84,981	...	12,588	15,894	1,300	21,358	...
1919	46,206	...	28,883	185	...	8,233	...
Naphthaline :							
1922	2,460	...	...	...	...	...	...
1921	2,593	...	1,516	417	110	173	169
1920	12,875	7,179	3,472	313	819	343	147
1919	8,966	...	5,993	340	1,199	77	345

Note.—There were no exports to Great Britain, France, or Germany during any of these years.

* Complete detailed figures by countries for 1922 are not available; blanks, therefore, following the total for that year do not necessarily mean that no trade was carried on with those countries.

Imports

In 1919 the United States supplied over 60 per cent. of the value of Japan's importations in this group, which embraces crudes, intermediates, and dyestuffs materials. In 1920 the value of these imports increased approximately 40 per cent., and the quota of the United States amounted to approximately 60 per cent. While the value of importations remained approximately the same in 1921, the share of the United States was but 16 per cent., the loss occurring in aniline dyes, wherein we supplied but one-sixth of that of the previous year. The total for the year 1922 indicates (from United States sources) that the United States supplied but one-sixth of that of the year 1919 and approximately one-half of that

of the year 1921. While this country maintained the same position as of the previous year in the supply of aniline dyes, yet the quantity of crudes and intermediates, according to United States export statistics, had decidedly fallen off. It is interesting to note the steady increase in the quantity of artificial indigo imported by Japan through the period 1919-1922. This product is gradually displacing the natural indigo.

Carbolic Acid.—In the field of crudes, as represented by carbolic acid, the United States and Great Britain obtained about equal proportions of the trade in 1919 and 1921. In 1920, however, Great Britain obtained two-thirds of this business, while in 1922 it had increased to three-fourths. Were the sources of crude coal-tar products in the United States to place in operation such plant facilities as would render maximum production, however, this country would be in a position to be the strongest competitor in the far-eastern market. At present even the United States has been a good customer of Great Britain in crude and semi-processed coal-tar basics. This serves to illustrate an instance in which much constructive work may be done by prospective exporters and other consumers toward educating potential producers in the United States along the line of conservation of crudes.

Aniline Oil and Salt.—This commodity, which has been taken as representative of the intermediate group, demonstrates the possible supremacy of the United States in the field of intermediates.

Following the post-war period to the close of the year 1921, the United States enjoyed the bulk of this trade. In 1921, however, Germany obtained over 25 per cent. of the business.

Aniline and Other Coal-tar Dyes.—The import market for dyestuffs in Japan has been increasing yearly, and from approximately 21,000 piculs in 1919 importation has increased to 70,000 piculs in 1922. In the initial year the United States obtained 75 per cent. of this business and approximately 66 per cent. in 1920, but in 1921 the participation of the United States amounted to but 15 per cent. current indications relative to the year 1922 (from the United States record of exports to Japan) are to the effect that our quota was not materially strengthened but, in fact, declined to 10 per cent. of Japan's total importation of this class of products.

In 1921 Germany, which during the war and prior to that year had been a negligible factor, received 75 per cent. of the business. Although Germany's position was materially strengthened, it is still not comparable with that country's pre-war position, and has been regained through the medium of price cutting and other measures.

German products have been aided to an appreciable extent by the good will and standard trade-marks with which the Japanese became familiar in pre-war years, coupled with the practice in vogue in all countries of standardizing samples against the pre-war German product. The combination of these factors with the attempts of all other dye-producing nations to compete with the German product in that market has practically destroyed the subsidized and partially protected independent dyestuff manufacturing industry in Japan. In fact, the well-established and powerful textile manufacturing industry of Japan has been favorable to products of foreign origin, from the standpoint of competitive price and quality.

It is encouraging to note that the United States has continued to maintain a fairly strong position in this market, regardless of the fact that it is an open one wherein none of the competing countries are favored by agreements, tariffs, of other regulations. This alone serves to indicate how well developed the dyestuffs industry of the United States has become. The fact that the United States has enjoyed the bulk of the market in Japan up to 1921 has served to acquaint Japanese merchants with the comparable quality of American products. The present time is, therefore, most opportune for further extension and development. An important phase to consider is that before the world war commenced in 1914 the United States was obliged to import about 90 per cent. of its intermediates and finished products, whereas domestic production now enables it to supply 93.5 per cent. of its own consumption and still to be able to export. The present line of development points to a strong possibility that the United States will soon produce larger quantities for export. As stated above, it is necessary to cultivate and develop good will quality standards abroad which will tend to place American dye exports on at least an even footing will those of the most formidable competitor, namely, Germany. The attainments of the American dye industry show that it has been marching forward at a rapid pace. The logical assumption is therefore that American production, which will soon greatly exceed domestic demand, must strongly enter the export field. With increased production should come lowered costs, and a natural consequence would be a lower and more highly competitive selling price in far eastern and other world markets.

While Germany has re-entered the Japanese market quite strongly still Germany's position in connection with available supplies of crudes, labor conditions, etc., is such at the present time that the American industry has less to fear from Germany in that connection than in the past, and there is no reason why the United States should not eventually be the major supplier of these commodities in the far eastern market. Finally, the hope of the Japanese to supply their consuming demand will not meet with very great success, even in the future, because of the fact that while formulas and methods are a matter of common knowledge, technique has not been acquired by the Japanese in a degree sufficient to afford the the United States strong competition from Japan's domestic production. The tendency of the Japanese is to concentrate more upon commodities involving the cruder processes of manufacture. Commodities which involve a high degree of technique or technical knowledge will for many years be controlled by the occident.

Artificial Indigo.—In connection with indigo, one point at least should be brought out. Natural indigo represents at present but one-third of the total quantity of indigo by Japan. Obviously, the United States has not exported any natural indigo to Japan, that being a commodity which is native to British India. Recent reports show, however, that the tendency to cultivate indigo in India has greatly lessened, and that the great acreage developed by war exigencies is now being discontinued owing to the abundance and the superior quality of artificial indigo. Japan's importation of the natural products declined 80 per cent. in 1922 as compared with that of 1920. In 1921 Germany was the principal supplier of artificial indigo in the Japanese market, approximately 66 per cent., followed by France as a very poor second, and the United States as third with 10 per cent. This artificial dye, representing approximately 25 per cent. of the synthethic dyes imported during the past two years, should certainly be made the principal point of attack by American producers. While the mark exchange may have been an added factor in Germany's favor in 1921, other conditions in Germany which have developed since that time are undoubtedly operating against that country's effort. If American products should be strongly pushed in Japan, a good will might be developed which could be displaced only with great difficu ty by any foreign competitor.

It is a well-known fact that many foreign countries, especially European countries which have been for years engaged in a large foreign trade, have, through the assistance of their own carriers, set up and maintained well-organized import and export positions. As the result of such organization they have been able to present a unified front both in the sale and purchase of materials. Such organization has been of inestimable value in rendering the most favorable quotations on the import and export commodities. The German dye cartel is the most conspicuous example of an organization which has been effective in developing efficient methods of production, which in turn permitted the lower selling prices, and through close centralized control and affiliations has rendered such an organization a formidable competitor in any foreign country which it enters. This result is particularly pronounced in Japan.

Other Chemical Products Derived from Coal-tar Distillates.—During 1922 products under this classification valued at Y.1,148,-000 were imported into Japan. Japanese statistic do not show the value of this material received from the different countries for that year, but United States export figures show that this country accountd for practically 70 per cent. of this group. In 1921, however, when the value reached Y.953,000, the principal countries of supply were Germany and the United States, in the order named, the former approximating 55 per cent. and United States sales aggregating about 40 per cent. of the total. Great Britain shipped but a very small amount. This classification is very general, and in Japanese statistics no doubt includes a great number of coal-tar crude products. This is one field in which American exports could be greatly increased if the producing industries could be taught the value of conservation. The field throughout the world for coal by-products is practically unlimited. The enormous increase in consumption in recent years is merely an indication of the great demand which may be fostered through the medium of education

(Continued on page 523.)

Tiffin-Time in Manila

A REVIEW

The United States and the Philippines, by D. R. Williams, published by Doubleday, Page & Company, New York

ANOTHER book on the Philippines. This time, however, it is a welcome contribution to one of our greatest problems and the public gets a survey of the facts from a man eminently qualified to treat the subject intelligently. Twenty years experience in the islands, at one time officiating as secretary to the Philippine commission, as judge of the land court and holding other responsible positions, Judge Williams may safely be accepted as an authority whose views may not be lightly challenged or set aside.

The purpose of the book is to sound a warning against conceding independence to the islands at this particular time of international political unrest, believing that acceptance of the Filipino plea would constitute a repudiation of obligations deliberately assumed by the American people. Judge Williams sees a crisis in our relations with the Philippines rapidly approaching and on the right decision of the American people hinge not only the progress and well-being of ten millions of Filipinos and their descendents but also the prestige of the United States and the part it is destined to play in the titanic struggle now shaping for trade supremacy in the awakening Orient.

In arriving at his conclusions, Judge Williams carries us through the intricacies of our entrance into the Philippines, down through the various administrations to the present time and in the two final chapters makes a brilliant summing up of the facts to support his thesis. In our opinion the book will stand as the best that has been written on this highly controversial subject. In nearly every point and conclusion it will be difficult to reverse his findings. Unfortunately, in order to strengthen his arguments, Judge Williams so far forgets his judicial character as to accept at their face value the stock arguments about Japan's designs on the islands as one of the reasons why America should hold on to them.

Judge Williams argues that the territories and possessions of Great Britain, France, Holland and the peoples of Australia and New Zealand would be vitally menaced by a Japanese dominance of Philippine resources and strategic bases and they would assuredly seek to forstall such consummation. After devoting several pages to the possible menace of Japan to an independent Filipino republic, he destroys his argument in one sentence: "*The situation was summed up,*" *he says,* "*by a somewhat cynical British naval officer in Hongkong, who remarked that if the United States gave up the Philippines, 'the Japanese will be in there by tea-time,' to which he added, 'The British, however, will be in there at tiffin-time.'*"

If coming events cast their shadow before, the tiffin-party would seem to be more of a certainty than the five o'clock ceremony, an eventuality brought measurably nearer by the construction of the Singapore naval base. The popular acclamation of the British project by the jingo press of America who see in this move a way to circumvent the provisions of the four-power treaty has not passed unnoticed in Japan, France or Holland. The Singapore base may be designed for the sole defense of the British possessions against any southern expansion of Japan, but it will be difficult to convince France that this is the sole reason.

The present conflict of policies in Europe may at any time align Britain and France on opposite sides of the fence, in which case a British naval demonstration based on Singapore would not only end French rule in Indo-China but settle for all time the conflict of interests in Siam. The whole of south-eastern Asia would then fall under British influence. It is little wonder the report persists that Japan and France have come together in some sort of an understanding to offset this menace.

The real reason for the establishment of a great British naval base at Singapore is not so much a fear of Japanese aggression as it is the uncertainty surrounding the permanence of American rule in the Philippines. The high board of strategy sitting in London reads and interprets correctly the handwriting written large upon the wall, and is satisfied that the day is not far distant when American authority will be withdrawn from the islands. As soon as the democratic party comes into power, the American flag will be hauled down. This ceremony may be deferred four or even eight years, but it will come. The democratic party is too far committed along these lines to retract. Keeping this possibility always in mind it is much easier to understand what is going on at Singapore and get the correct angle on that nice little tiffin party in Manila Bay. When American writers so far forget the rudiments in the game of imperialism as to urge that we remain in the Philippines in order to guard British possessions in India, Malaya and Australasia against possible Japanese aggression, it must excite the risibilities of a nation of men who jolly well know their own game and how to protect their own interests.

Judge Williams quotes William Howard Gardner who holds that our decision over the future of the Philippines has an equal influence in deciding the future of the Netherlands East Indies and Australasia to say nothing of the future of India, of Malaya, of China and of all for which our civilization may stand in the Orient. In short, the American, the British and the Dutch circles concerned with matters of international grand strategy in the Far East recognize explicitly that the guard the United States mounts at the Philippines is essential to the security of Australasia and to whatever measure of peace may be maintained "east of Suez."

In taking this stand, both Judge Williams and Mr Gardner are repeating arguments originally advanced by THE FAR EASTERN REVIEW in its article entitled "The Keys of The World," published in April, 1921. These conclusions are sound, advanced at a time when conditions in the Pacific were different from what they are to-day. In accepting this argument as an important phase of the Philippine question, the American people are being asked to constitute themselves the guardian of British and Dutch interests in Eastern Asia and Australasia against the possible menace of Japan. The average high-minded American will cheerfully admit and accept to the full his direct responsibilities to the Filipino people but if this obligation implies that he must also stand as the bulwark of European imperialism against Japan's legitimate aspirations to exist within her own sphere and shoulder the task of confining her people in a water-tight compartment for the advantage of Great Britain and Holland, then he may well begin to open his eyes and ask where all this is leading to.

If our experiment in the Philippines is to place us squarely across the path of Japan as the pawn of Europe in a part of the world we have entered solely to elevate a backward people to our level of civilization, the sooner we repudiate these obligations and get back to firm ground the better it will be for everybody. There are altogether too many points of contact between the United States and Japan. Our China and Siberian policy has driven Japan into Manchuria to make her last stand for the right to exist and it hardly becomes us as a peaceful and just nation to expose ourselves to the charge that we are wilfully driving this heroic people to desperation by declaring in so many words that our continued presence in the Philippines is a challenge to their expansion southwards. Some day, Japanese and Chinese will enter the Philippines on a plane of equality with other peoples. That day, perhaps, may mark the end of Filipino economic independence but it will constitute no more of a menace to the political independence of the islands than the present tendency of British or American commercial expansion.

The words of the British naval officer quoted by Judge Williams tell us that there is another side to the question of Filipino independence and by implication says that not only must the United States stand as the buffer against possible Japanese expansion southwards but by the same logic we must guarantee that Japan will never be attacked from this quarter. European propaganda is steadily goading us along a road that can

end only in disaster. We have already constituted ourselves the protector of China and the policeman of Siberia and Manchuria in addition to guarding the Philippines, and in every way possible we are being pushed across the path of Japan by skilfull diplomacy and relentless propaganda. And the unsophisticated American quietly accepts a situation that will draw down on him the solution of problems in the Pacific which should be settled in central Asia, where they belong. Every move we make in China strengthens the hand of Russia in Asia and her implacable determination to ruin Japan and now we cheerfully permit those who advocate retention of the Philippines to tell us that we must remain in the islands to protect Great Britain and Holland against Japan.

Judge Williams falls into the common error of accepting at its face value the statement that the islands are not costing the American people anything for their upkeep. What are the facts, he asks, and then goes on to quote the secretary of war who testified that the only saving to the treasury through abandonment of the islands would be the present upkeep of the Philippine scouts, about $2,000,000 per annum. He then turns to the credit side of the ledger and itemizes the vast undeveloped natural resources of the islands, overlooking that these must remain a liability instead of an asset as long as the laws are so framed as to prohibit their development. He points to the advantages accruing to American trade from our occupation of the islands. In 1923 this trade amounted to $132,000,000 or 65 per cent. of the total—of which, about $50,000,000 represented the value of American exports to the islands under a free trade system, which since 1909 has given Americans this advantage over their competitors.

In a previous chapter Judge Williams admits that all Philippine products imported into the United States could be just as well imported from other tropical countries should the Philippines be unable to meet the resulting competition when called upon to pay duty, which implies that the United States is not dependent upon the Philippines for these products. They can be obtained as cheap or cheaper elsewhere. He then states that the advantage accruing to the Philippine producers of sugar, coconut, oil, tobacco, embroidery, etc., through free trade with the United States amounts to $40,000,000 annually.

This means that the United States treasury is remitting $40,000,000 annually in duties on products that can just as well be purchased from other sources and at a lower price and this sum employed to wipe out our war debt. However, we prefer to present this sum to the Filipino in order that we may export $50,000,000 of manufactured American goods on which the profits will not average more than five per cent., a total benefit to the nation of $2,500,000. Now, the revenues of the Philippine government amount to about $33,000,000, so if figures do not lie, the fact would seem to be firmly established that the American people are called upon to pay out indirectly $40,000,000 for the benefit of insular industries in order to create a fictitious prosperity that enables the insular government to collect the $33,000,000 required to maintain itself. Now there may be some rule of logic that can explain away the statement that the islands are not costing us anything, but it is difficult to explain the difference between a direct subsidy of $40,000,000 voted by congress annually for maintaining the Philippine government and an indirect subsidy of the same amount camaflouged behind tariff exemption which accomplishes the same purpose.

Judge Williams recognizes these facts when he says that "with the principal industries of the islands paralyzed or sorely stricken through denial of our markets, and the masses of the people reduced to the poverty and misery of Spanish days, the reaction upon public revenues would be immediate and disastrous." He admits that in consequence of American occupation and free trade, wages are double and treble those paid in Spanish times and the scale of living much higher than in other Oriental countries. In effect, wages in the Philippines are in reality about ten times higher than in China or Indo-China, Siam and Malaya. Judge Williams corroborates in part the statement emphasized in the October number of THE FAR EASTERN REVIEW when he says: "This fact, coupled with their natural proclivities, would render it difficult if not impossible for Filipinos to meet on even terms the cheap labor of China, Japan, Java and other countries whose products would come into competition with those of the Philippines." Judge Williams is wrong about the wage rate in Japan, but that is another story. It would be easy enough to use the evidence of Judge Williams to support that of Mr. Renton Hind and prove that the only tangible result of our charity in remitting $40,000,000 a year in duties on Philippine products has been to maintain the Filipinos in a state of arcadian idleness from which they rouse themselves to give one hour of their time in exchange for the full-day wage this charity on our part enables their employers to pay them. That we have not slandered the Filipino people or presented a distorted picture of the real situation, is borne out by an interview with Mr. Pardo de Tavera recently published in the *Philippines Free Press*. Mr. Tavera was a member of the first Philippine commission, one of the foremost leaders of his people. In effect, he advocated the passage of laws that would compel the Filipino to work, reverting unconsciously to the system employed by the Dutch to get an honest day's work from the Java Malay.

When, in addition to paying out $40,000,000 a year for the privilege of running a government whose expenses do not exceed $35,000,000 and maintaining an ungrateful people in comparative idleness, Americans are told that they must stand as the guardian of India, Australia, New Zealand and the Netherlands East Indies against the possible expansion of Japan to the south, it is rubbing it in a little too thick.

If this conception of our duty is to prevail, the traditional caricature of Uncle Sam may as well be redrawn, depicting the kindly old gentleman on all fours with a pair of horns protruding through his high beaver hat, and a marcel wave to his chin-whiskers, giving him his proper label—The International Goat.

Japan's Port Works Appropriations

A program of ports and harbor construction for the coming fiscal year will have a total fund to draw on of Y.9,372,000.

This was announced, when it became known that the government has set aside Y.5,115,000 in its appropriations totaling Y.151,515,687 for the next year's expenditures. The remainder of the total fund is to be derived from local governments.

The proposed plan of general improvement and reconstruction work in Japan's ports and harbors lies within the jurisdiction of the department of home affairs. While a larger program had been tentatively planned, this fund will enable much to be done.

The plan to improve Komatsushima port will have to be postponed for the time being. However, many other places will be completed by the appropriation to be available during the coming year.

Table of Ports

A table of the ports now under construction and the funds appropriated for those to be finished follows:

Improvement of	Percentage of work done.	The sum for the fiscal year 1925.	The sum appropriated by Government.
Kwanmon Strait	84	Y.750,000	Y.750,000
Yokohama	47	2,500,000	2,500,000
Shiogama	71	300,000	—
Niigata	92	215,000	—
Kobe	56	2,200,000	1,090,000
Moji	67	450,000	450,000
Nagasaki	79	229,000	—
Yokohama	47	2,500,000	2,500,000
Shimonoseki	40	400,000	240,000
Shimizu	56	847,000	85,000
Sakai	25	280,000	—
Takamatsu	49	400,000	—
Tsuruga	13	350,000	—
Imaharu	11	150,000	—
Komatsushima	3	—	—
Kagoshima	7	200,000	—
Yokkaichi	87	796,000	—
Nagoya	80	1,690,000	400,000
Nawa	83	245,000	150,000
Funakawa	72	320,000	—
Osaka	86	1,304,000	—

The Chinese Telephone System in Shanghai

By K. Rothe, Engineer-in-Chief, Chinese Government Telegraph Administration, Shanghai District

MANY people, when speaking of Shanghai, think only of the international settlement and French concession, and even among those who themselves reside in Shanghai not a few are found who never go near the "city" and think of Nantao and Chapei, as they were before the revolution and do not realize the big strides towards modernization which in spite of all difficulties have been made in these districts in recent years. There is, it is true, yet a long way to go before really modern conditions are reached, but conditions are in fact not so far behind those found in the "Model Settlement."

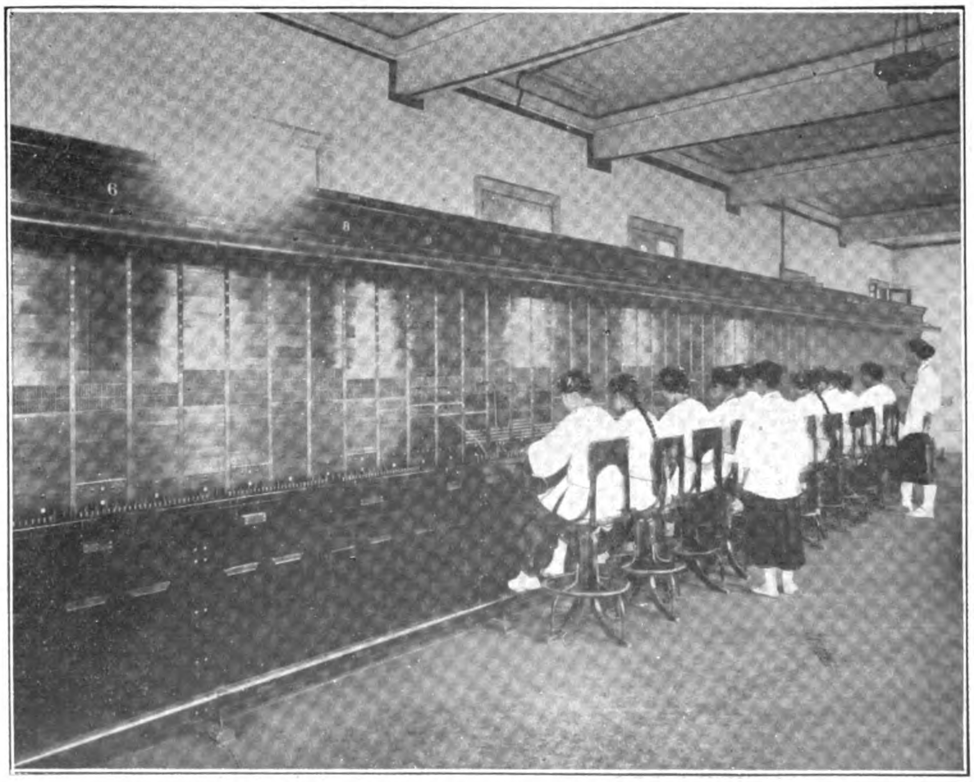
One of the sure indications of the development of a city is the state of its telephone system. The Chinese telephone service throughout the country like other branches of communication in China, develops slowly, but nevertheless steadily and surely. It may perhaps even be better for the service that it develops quietly and without much notice and though its officials and engineers are often on the verge of despair because of the difficulties, financial and otherwise, which beset the service and the obstruction placed continually in the way of expansion; the service manages slowly to force its way towards its goal—telephone intercommunication within the reach of everybody in the country.

The Chinese Government Telephone Exchange in the Chinese City of Shanghai

The exchanges in the Shanghai district labor under special difficulties created by the fact that, in spite of negotiations begun more than twenty years ago (when the writer was assistant in the Shanghai Mutual Telephone Co.) arrangements have not yet been made for intercommunication with the exchanges in the foreign settlement, so that telephonically the Boulevard des deus Republiques and other "boundary roads" might, except for a few direct subscriber lines owned by the Mutual Telephone Co., be as wide as the Pacific Ocean—truly an abnormal situation in a great commercial city like Shanghai; and also because toll lines to other important centres like Soochow, Wusieh and Nanking—let alone Hankow, Peking and Tientsin—have not yet been built (although long ago decided upon and the necessary materials bought), on account of obstruction by certain influential bodies. One wonders how long the local population will quietly submit to such conditions.

In spite of these difficulties, which prevent normal expansion, the administration three years ago opened a fully modern central battery exchange serving the city and Nantao district, while the smaller exchange in Chapei is yet worked on the magneto system general in Shanghai. The two exchanges are connected by trunks which run a distance of 10 miles all the way along the west side of Siccawei creek past Siccawei village and along the railway to Markham junction where they join the Chapei cables, a most unsatisfactory arrangement, but one which under existing circumstances cannot be altered. During the recent disturbances the Shanghai Mutual Telephone Co. did, however, show the sister service the courtsey of kindly permitting, for a nominal fee, the use of some of its cablewires for temporary emergency trunks through the settlement. From Chapei exchange two trunks run to Chenju and two to toll lines in Nanziang. In Chenju is a small private exchange subscribed for by the college. In Nanziang the administration has a small public exchange worked on the magneto system.

The *Nantao Exchange*, from which the accompanying photos are taken, is housed in a substantial three-storied building, constructed of brick, with floors and staircases of reinforced concrete. The building is situated on the Chung Hwa Road, the broad boulevard constructed on the site of the old city walls, near the South Gate. The equipment, which was delivered by the China Electric Co., is of Western Electric manufacture. In the upper story, which is taken up by the switchroom and waiting rooms for the operators, the local and toll switchboards are placed. The local switchboard of W.E. central battery, multiple relay type, has a present capacity of 2,000 lines and an ultimate capacity of 8,000 lines. Eight "B" positions accommodate the 150 incoming trunks and 26 "A" positions the present 2,000 local lines. The toll board, as yet not in use, is at present equipped for 10 toll lines 20 toll switching trunks and 30 recording trunks.

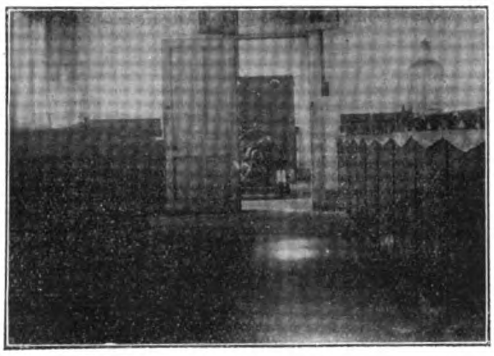


Switchboard in Chinese Government Telephone Exchange, Shanghai

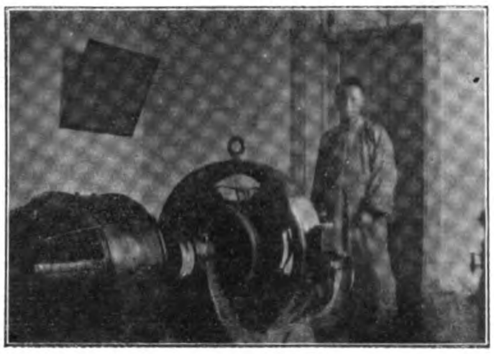
The operating staff is all female, with Chinese ladies as supervisors and chief operators. Each operator serves 120 lines and works normally six hours a day divided into two shifts. The traffic on account of the special circumstances limiting the service, is very low for China—while in Tientsin and Peking 25 calls per line per day is usual, in Shanghai the calling rate is only 8.

On the second floor is found the test and

Test Desk



Battery and Power Rooms



Charging Motor-Generator

distribution room, the power room, the battery room and the offices for the engineer departments, while on the ground floor is the office of the general manager, the chief accountant and the general office as well as a reception room.

The distribution frames and equipment are of the usual type for C.B. work. All through the equipment enamelled wire is used.

The M.D.F. is equipped with 3,000 protector pairs, to which the underground cables are directly connected. The I.D.F. is equipped for 200 lines. The relay rack with 2,000 line and cut off relays type W.E.A. 1 and 2 and the necessary relays for trunking and toll service. Behind this rack is the coil and condenser rack and the fuse board, fitted with fuses with visual and audible alarm. The wire chief's desk is fitted with all necessary keys, jacks and instruments for testing purposes.

The batteries consist of two sets of choride accumulators each of a capacity of 1,200 amp. hours (tank cap. 2,400 A.H.)

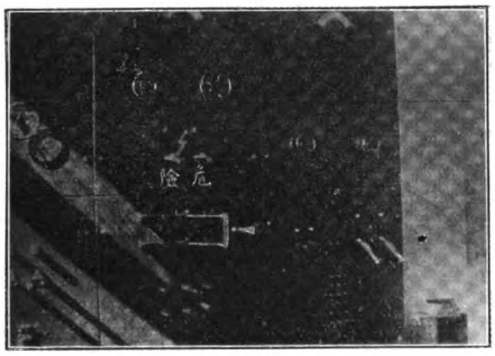
In the power room there are two sets of ringing machines, one belted to an A.C. motor, one a dynamo of bipolar type 22 V.D.C., both machines generating A.C. 75 v. ringing current are mounted, also a charging motor-generator—motor voltage 500 D.C., generator output 300 A. 30v.

In a separate building in the compound is mounted another charging generator of same type, belted to an oil engine.

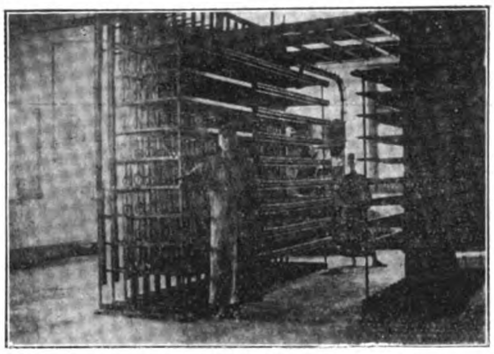
In the compound has been erected substantial quarters for the staff and a godown, both constructed in brick and concrete.

The outside cable system consists of about 4,000 yds. underground (300 p.) dry core cable and about 40,000 yds overhead cable. The length of aerial lines is about 20 miles. The total length of open wires being about 200 miles, and of cable wires about 1,500 miles.

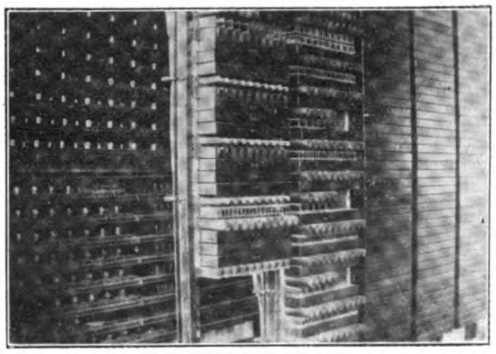
The subscriber's instruments are all of Western Electric manufacture, both wall and desk instruments being of the metal cover type with hand-micro telephones. The transmitters are of the capsule type.



Power Switchboard



Main and Intermediate Distribution Frames



Relay and Coil Racks

Electricity in Tibet

British Firm Providing First Generating Plant for Lhasa

THE first electrical installation for use in Tibet has been made by a British firm. The installation consists of an Armstrong-Whitworth water turbine direct coupled to a Crompton three-phase alternator of 125 Kva capacity, 500 v, 40 cycles working at 1,200 revolutions per minute. The alternator is provided with a direct coupled d.c. generator for supply of 20 kw at 220 v, for excitation of the alternator, and for other auxiliary work requiring adirect current. The design of the field magnets follows the usual practice adopted by Crompton & Co. for hydro-electric alternators which have to withstand test speeds of 80 to 90 per cent. above the normal full speed.

With this particular installation it was essential that all parts should be of the most robust character, in view of the peculiar conditions attached to this installation and the inaccessible district where the plant is installed. It was necessary that the individual weights should not exceed 10 cwt. packed, it being necessary to transport the equipment for 350 miles by mules and coolies.

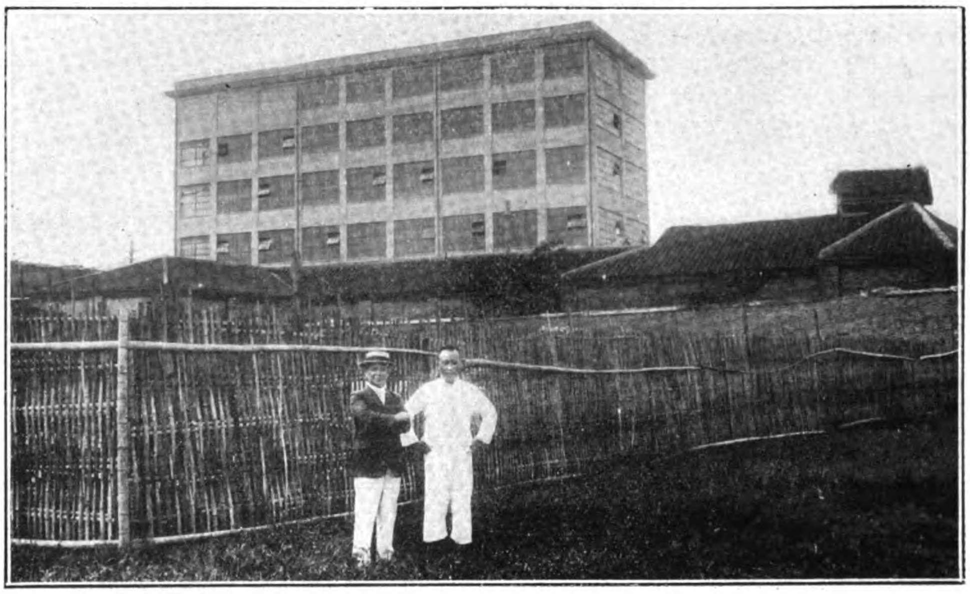
The plant was designed to operate continuously at a temperature rise not exceeding 35 deg. C., measured by thermometer after a six hours' run at full load on site, corresponding allowance having to be made on test here for the high altitude at Lhasa. The plant was constructed under detailed inspection of the Tibetan authorities from Lhasa, and the greatest care was observed in ensuring that all parts, spares, etc., would be interchangeable wherever possible in view of the fact that the plant would be erected entirely by Tibetans, no European engineers being permitted to enter the district.

The whole of the electric control gear was supplied by Crompton & Co., and comprises a standard open type switchboard with enamelled slate panels with the usual instruments, circuit breakers, current transformers, exciter, and field regulators, etc. There was also a special panel for the exciter and the d.c. feeders, and feeders for transmitting power some five miles away from step-up transformers.

The Yue Tung Flour Mill at Shanghai

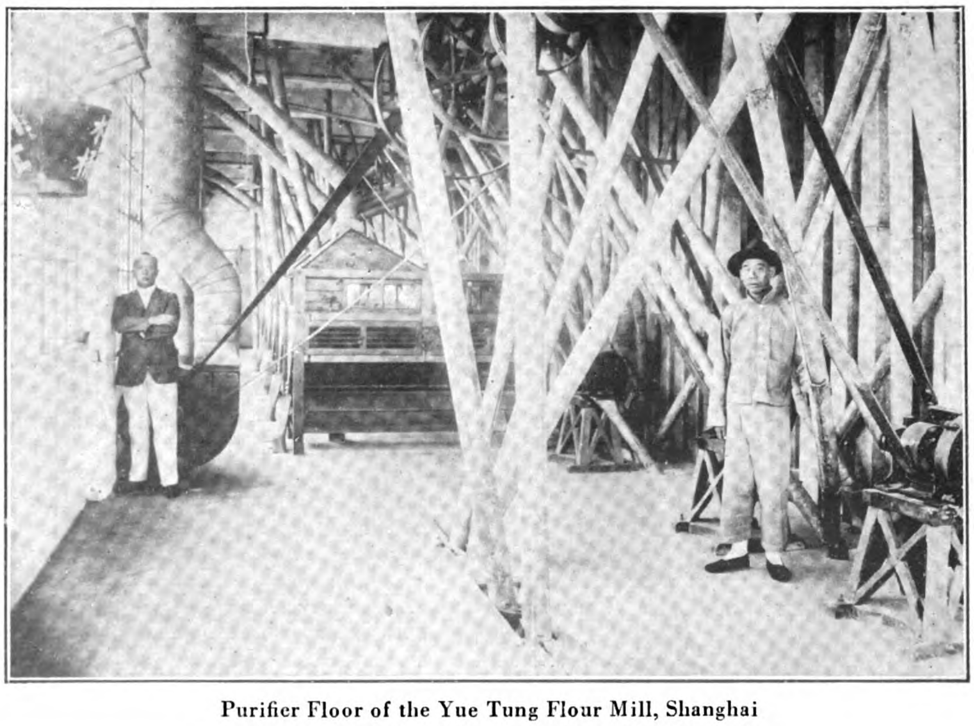
A Sprout, Waldron & Company Installation

WHILE the staple food cereal of the great majority of the Chinese people remains, as it has been for centuries, rice, there is a steadily increasing demand in China for other cereal products. The Chinese who visit and remain for any length of time in the United States and Europe acquire a liking for the cereals so largely consumed in those countries and there is a steady and increasing sale of wheat, corn, rye and barley flours to China. In many of the upland districts of China grain, other than rice, is successfully cultivated, but the Chinese facilities for its reduction to flour or meal are of the most primitive character and depend almost entirely on manual or animal power for operation. The fact that for the calendar year 1922 exports of flour from the United States to China amounted to 832,897 barrels, having a value of $4,211,713, furnishes fairly good evidence of the growth in popular favor of the product of American flour mills.



Yue Tung Flour Mill, Shanghai

But China is evidently not willing to depend entirely on imports for the flour demanded by her population in constantly increasing quantity. The introduction of a hand grinding mill of simple construction and its immediate popularity inspired the Chinese with the idea of making their own flour, and within the past few years some well-equipped flour milling plants, furnished with every modern improvement, have been established in different parts of the country. A considerable share of the machinery for these mills comes from the United States, the American milling practice, as practically manifested in the product of the American mills, impressing the Chinese buyer as most desirable. In 1922, flour milling machinery totaling 3,248,846 pounds in weight and valued at $558,678 was exported from the United States to China, and 1923 is likely to show an increase in both volume and value in this export item.



Purifier Floor of the Yue Tung Flour Mill, Shanghai

The magnitude and character of the modern Chinese flour mill is shown in the illustrations of the Yue Tung Flour Mill at Shanghai, for which Sprout, Waldron & Co., of Muncy, Pa., U. S. A., furnished the equipment through their agents, Arnhold & Co., Ltd.

The main mill building follows what is known as the daylight plan of mill construction and is a substantial edifice of modern type of re-inforced concrete construction. The plant is of ample capacity for turning out 1,500 barrels of flour every twenty-four hours.

The grinding floor, which forms the subject of one of the illustrations, is equipped with 24 double stands of Monarch self-oiling roller mills, made by the above firm, a machine that enjoys the highest reputation for economy of power and minimum wear in operation and excellence of product.

On the purifier floor, also illustrated, there are eight No. 3 middlings purifiers and graders, in which the middlings is handled before going to the break reductions. On the sifter floor, a view of which is also given, there are eight modern type level sieve machines of the company's construction.

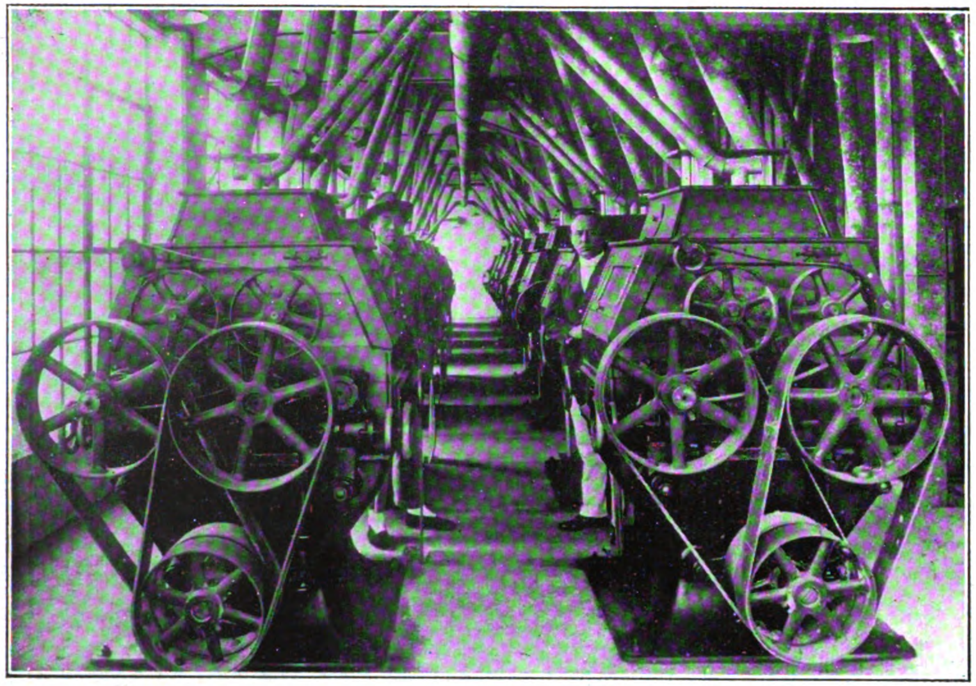
All the machinery installed is of the most approved and simplest construction, so that the least possible skilled labor will be required in its operation. The self-oiling feature is of particular importance, the duty of lubrication being practically dispensed with. The adjustment of the machines calls for no special skill and being for the most part constructed on the interchangeable plans, any renewals called for by reason of wear or accident can be readily effected.

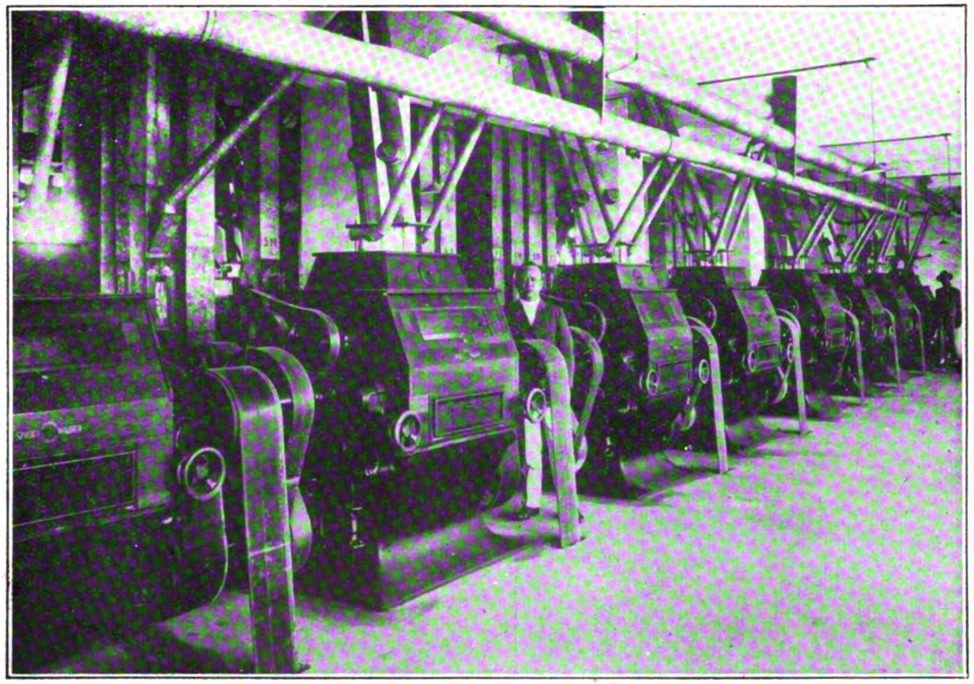
In addition to the improved machinery, the equipment of the mill in every respect complies with the latest requirements of modern milling practice. Steel is used wherever possible in the installation work, which includes elevators, spouting, wind-trunking, dust collectors and all other accessories that enter into a complete plant of this character, so that the establishment is to all intents and purposes fire proof and is protected by the

(*Continued on page 539.*)

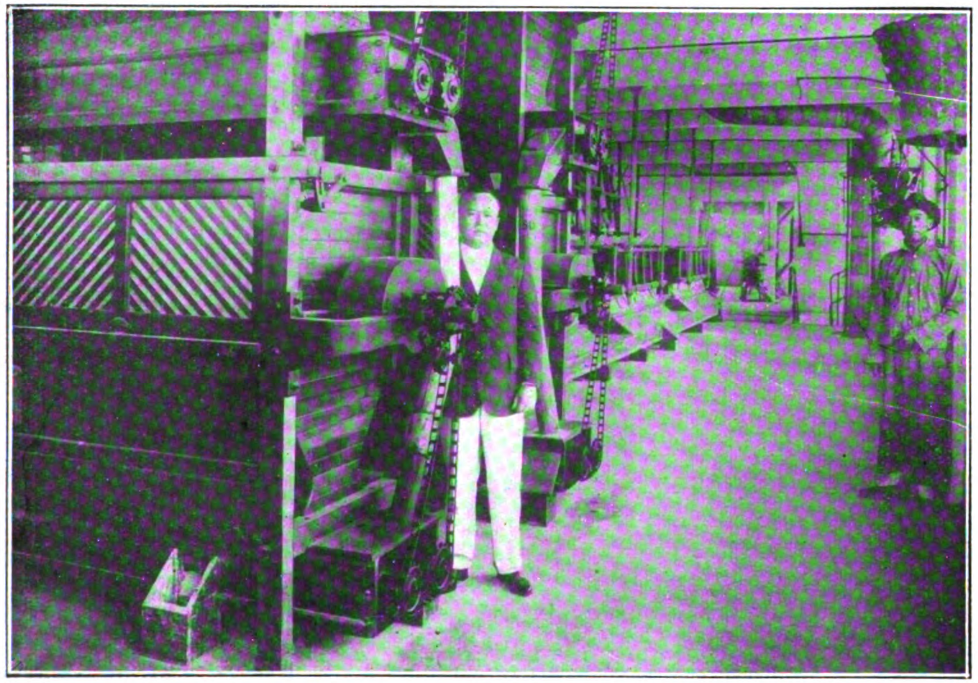
THE YUE TUNG FLOUR MILL AT SHANGHAI

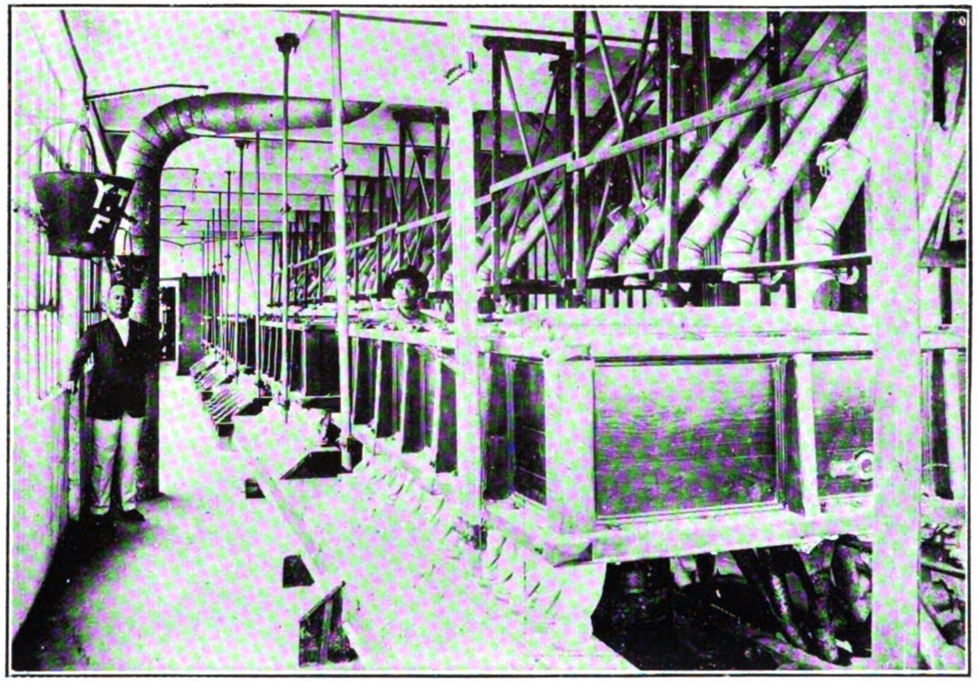
A Sprout, Waldron & Company Mill Furnished by Arnhold & Co., Ltd.



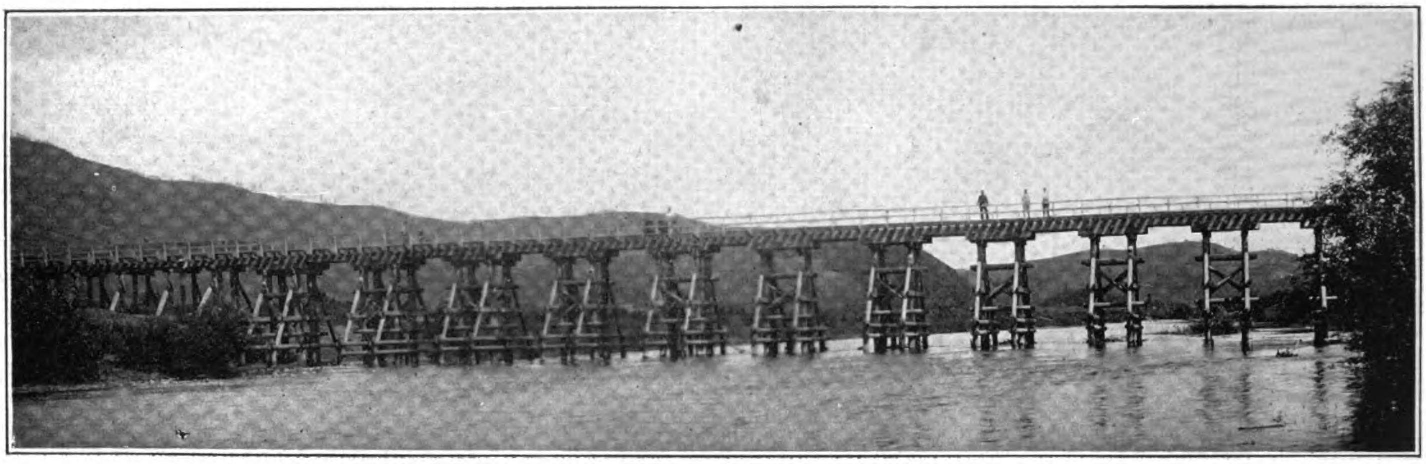


Two Views of Grinding Floor





Two Views of Bolting Floor



390-ft. Timber Bridge Across River Maihe at Imienpo

Lumbering in North Manchuria

Trials and Tribulations in the V. F. Kovalsky Concession Developments

DEVELOPMENT of the lumber industry of North Manchuria has been retarded from social, political and economic causes. It is slowly breaking through the crust of these influences and bids fair to become a factor in the world's lumber production. It is a country with large potential lumbering possibilities. An interesting prospectus showing the timber concessions of V. F. Kovalsky, in North Manchuria, with head offices in Harbin, China, has been issued. The prospectus is printed in three languages—Russian, English and Japanese. It is well illustrated. The prospectus was issued to commemorate the 25th anniversary of the construction and operation of the Chinese Eastern Railway. The description of this pioneer lumber enterprise is illuminative of the tribulations encountered in the development of the North Manchurian lumber business. It is quite similar in many respects to the early development of the lumber industry of the United States, and especially of the Pacific Coast, British Columbia and other sections of the world.

The Timberman takes pleasure in reproducing the prospectus and also some of the pictures illustrating this Manchurian lumber enterprise.

The timber concessions, six in number, cover a general area of more than 5,000 square versts (2,200 square miles), located on both sides of the eastern line of the Chinese Eastern Railway, within 44 degrees 25 min. and 45 degrees 35 min. north latitude and from 128 degrees to 130 degrees 20 min. east longitude, and extending along the Chinese Eastern Railway from the Yakuni siding to Mulin station.

The above mentioned general surface area is divided into separate concessions as follows:

Concessions 1 and 2.

Concession Yablonia about 2,420 square versts (1,060 square miles).

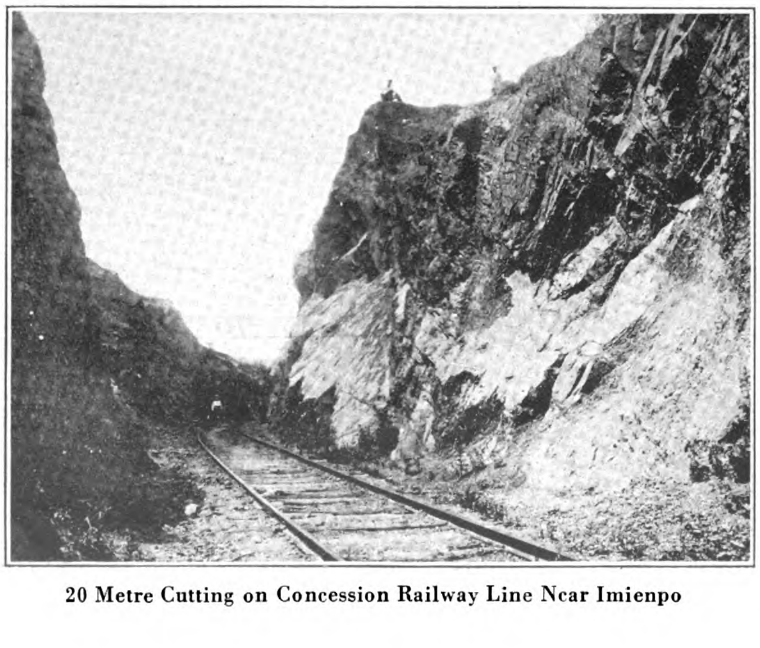
Concession Imienpo about 450 square versts (105 square miles).

Concession Hailin about 650 square versts (285 square miles).

Concession Handachetze about 380 square versts (165 square miles).

Concession Mulin about 1,500 square versts (660 square miles).

Total—5,400 versts (2,275 square miles).



20 Metre Cutting on Concession Railway Line Near Imienpo

The rights of the firm in respect to all concessions are based on contracts, registered with the Chinese authorities.

On all concessions there is a total stand of timber, mostly cedar, of about one billion cubic feet.

The predominant tree species are cedar, fir, larch, oak, velvet tree, elm, etc.

The main lumber requirements constitute: (*a*) Chinese Eastern Railway: firewood and sleepers. (*b*) Export: Squared cedar logs, sawn materials, aspen logs for match manufacturing, hardwood veneer logs and mining timbers.

In addition to navigable rivers the concessions have at their disposal the following means for transportation of timber:—

94 versts (41 miles) narrow-gauge light track.
25 versts (11 miles) broad-gauge railway lines.
8 versts (3.5 miles) cableways.
250 versts (110 miles) common roads.

The firm possesses its own rolling stock, 70 open truck cars of a loading capacity of 700 poods (25,000 pounds) each. Loading and unloading is performed by cranes and other mechanical equipment.

A sawmill with seven frames and several working lathes is located at the Yablonia concession, with a yearly output of 3,000,000 cubic feet.

In the course of the operation of the concession permanent dwelling quarters (brick-built or hewn from beams) have been constructed with a floor space of about 1,200 square sagenes (58,800 square feet) and temporary premises, huts, barracks, mud-huts, aggregating about 4,000 square sagenes (196,000 square feet).

During the period of the operation of the concessions the firm has expended:

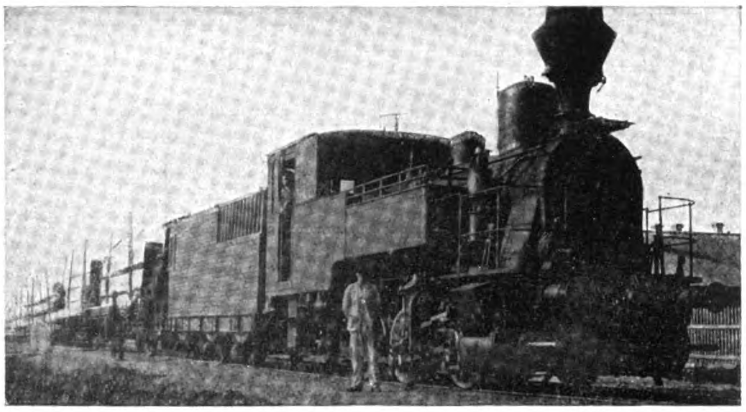
(*a*) For the construction of railway lines (exclusive of the cost of rails and rolling stock), narrow gauge, light track, cableways and common roads, 800,000 gold roubles ($416,000).

(*b*) For repairs, maintenance and protection of the above roads, more than 270,000 gold roubles ($140,000).

(*c*) For construction, repairs, maintenance, protection and insurance of dwelling premises with offices, about 315,000 gold roubles ($164,000).

(*d*) For installation and equipment of sawmills, about 280,000 gold roubles ($145,000).

Log Jam on Liantzshe River Just Before it was Broken



Train on Concession Tracks Ready to Leave for Mill

(*e*) For operating expenses of all the concessions 8,435,000 gold roubles ($4,385,000) have been disbursed, subdivided as follows: To workmen and cost of carts 5,391,000 gold roubles (2,805,000). Stump taxes, duties, taxes and sundry fees to the Chinese treasury, 1,232,000 gold roubles ($640,000), and 1,812,000 gold roubles ($942,000) for various general expenses, management, losses from fires, compensation for accidents, salaries, wages, gratuities, etc.

The total amount expended in the course of operation has been about 10,100,000 gold roubles ($5,252,000).

The number of workmen employed on the concessions yearly fluctuated between 2,000 and 8,000 men, and the number of salaried employes between 400 and 300 men.

At present the different enterprises of the firm employ, exclusive of the staff in the offices, consisting of one construction engineer, four trained forest keepers, one legal counsel, four mechanical engineers, five commercial correspondents and seven interpreters for Chinese, Japanese and English business.

The main concession, Yablonia, is provided with a gymnasium, school, library and reading room; besides newspapers and periodicals are subscribed for all concessions for the benefit of the employes.

Logs on the Up Grade

The importance of the enterprises and the activity of the firm in the region of its nearest influence can be characterized by the following data:

The territory, which is served by all the roads constructed by the firm, measures about 20,000 square versts (8,800 square miles).

The population of the territory consisted before the concession period mostly of hunters and vagrant elements and amounted to only 20,000 or 30,000 individuals, mostly men, whereas at the present moment the population is over one million persons, including women and children.

Up to the inauguration of Kovalsky enterprises this country was almost a desert and now it is colonized exclusively by Chinese. Originally they engaged as workmen for various forest work, and later, having earned and saved a certain amount, they acquire livestock and inventories, settle down on vacant lots of land, and being to some extent protected from hunhutze raids in the neighborhood of the concessions, engage in farming, which represents the chief occupation of the settlers. During winter and at such times when not occupied by farming they work on the timber concessions, thereby making substantial extra earnings.

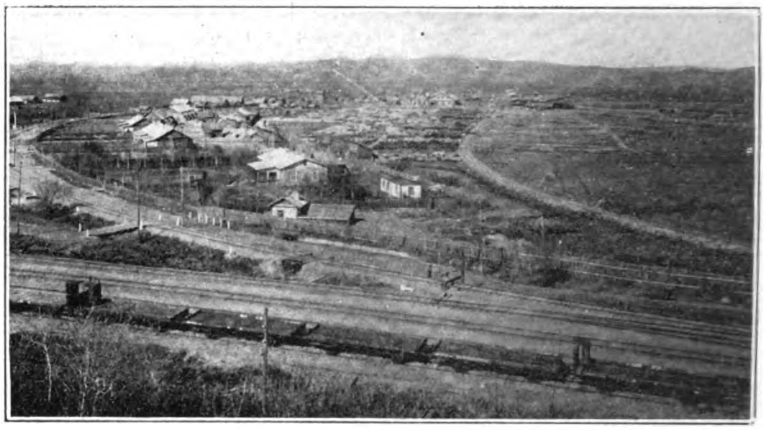
According to information gathered by the firm of V. F. Kovalsky, the production of the above named territories, gathered from its fields in 1921, comprised: Ten million poods (360,000,000 pounds) of cereals, beans, kaoliang, kutza, wheat, buckwheat, barely, corn, paitza, rice, mitza, and about 1,000,000 poods (36,000,000 pounds) of special plants used for technical purposes, including hemp, indigo, tobacco, poppy, etc., in addition to the products of gardening, cattle breeding and poultry raising.

From this data one may judge the benefits the timber enterprise of this firm has confirmed upon the whole region in a comparatively short period. The material and economic progress of the territory, which was previously a desert wilderness, is due not only to the united management of the firm's staff, but also to the far-sighted assistance rendered by the Chinese Eastern Railway, skilfully directed by a single will, and to the energy and efforts of the railway employes.

Loading Cars for the Cableway at Hantaohetze

Waiting for the Cable Log Train up the Hill at Hantaohetze

The Sawmill at Yablonia



General Layout of Yablonia

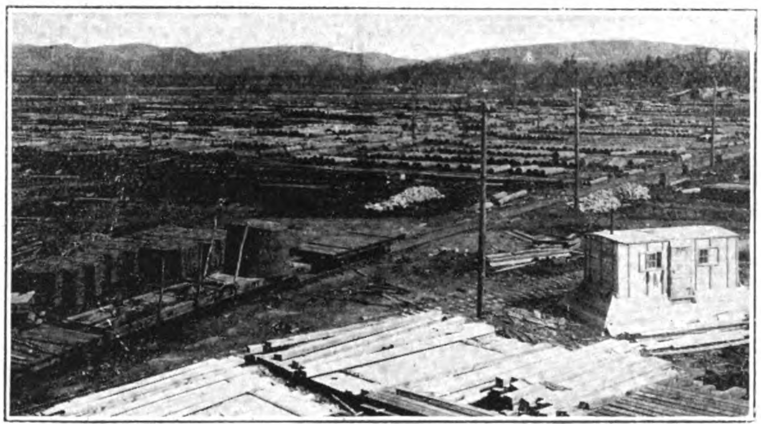
The development of the firm of V. F. Kovalsky is closely connected with the history of the Manchurian timber industry in general and with its origin and evolution up to the present time, the Chinese Eastern Railway and extending along its eastern line.

The history of this industry may be divided into four periods, which may be generally characterized as follows :

The first period extends from the beginning of the construction of the Chinese Eastern Railway up to the beginning of operations on the first of July, 1903.

Prior to the construction of the railway the immense neighboring forest zone, being of the same extent as the kingdom of Belgium, was an absolutely wild desert and marshy country. Bogs were predominant, even on the steep slopes of hills, without any population, lacking roads and only crossed by hunters' tracks.

Human habitations were rare, consisting of wretched mud huts, hastily erected from brushwood and covered with mud, with unglazed windows and inhabitated by hunhutzes and half-savage huntsmen. Still more rarely in the impassable forest, generally along the river valleys, one might have found meadows covered with high, dense grass, concealing traces of villages destroyed or burnt by hunhutzes. These are the traces of the colonization policy of the government, persistently carried out during a long number of years, and which always experienced setbacks, because of the absence of roads and the remoteness of the territory from large centres.



Products Stacked Ready for Shipment from Yublonia Yard

It was only natural that in such a country the first work carried out by the constructors of the Chinese Eastern Railway was forest work, cutting trails for temporary cart roads, clearing land for settlement, providing fire wood for the severe Manchurian winter and producing beams for dwelling houses, bridges, telegraph poles, sleepers, joists, planks and other materials for the enormous requirements of the Chinese Eastern Railway under construction.

The whole railroad system was inspired by the genius of Mr. S. J. Witte, who was the chief organizer of the Chinese Eastern Railway through Manchuria, and who chose for the exceptionally responsible post of chief engineer and leader of the peaceful policy, Mr. A. J. Yugovich, a man with vast experience, good sense, firmness of character, with American resourcefulness and without the bureaucratic routine principles, which were peculiar to many eminent constructors of Russian railways in those days.

Eighteen months had hardly passed since the beginning of the work when an important part of the territory of the Chinese Eastern line, about 300 versts (200 miles) was covered with stores of beams, sleepers, joists, planks, firewood and telegraph poles. However, such preparation for timber were made exclusively for the construction requirements of the railway and therefore were not of any industrial importance. Later, when the track had been laid from Harbin to Shitouhetze, at the end of the year 1899, private contractors began gradually, and for their own account, to start logging operations and to transport timber materials and firewood to Harbin. However, the Boxer movement of the year 1900 stopped this work and for almost two whole years drove out private initiative and capital, which had already begun to come in from Russia.

After the liquidation of the Boxer insurrection logging operations again rapidly developed, though they continued to be almost exclusively carried forward for the requirements of the Chinese Eastern Railway and at its expense.

After the opening of regular traffic on the Chinese Eastern Railway on the first of July, 1903, logging operations by the railway were discontinued, with the view of ascertaining the exact yearly requirements of the railway for firewood and various timber materials. The plan contemplated the introduction of regular timber exploitation in the future and to attract big contractors who should work with their own capital and their technical staff and resources. However, the timber industry, which had just started again, was stopped in its development by the Russo-Japanese war, and soon fell into a chaotic state. A great many people quickly enriched themselves on timber deliveries to the railway and particularly to the war department and afterwards lost very quickly what they had gained, and were ruined. This period of feverish activity in logging operations called forth by the war, the gradual decline of this industry and its almost complete standstill, excepting a few insignificant deliveries to the railway, lasted about five or six years and did not give any positive results in the development and strengthening of the timber industry along the eastern line of the Chinese Eastern Railway.

The third period is the history of the timber of North Manchuria began with a slow and at times irregular influx of private capital, which soon increased and grew stronger in spite of many unfavorable circumstances, the promoters and the capital being almost entirely Russian. During the construction of the Chinese railway and especially during the Russo-Japanese war, all the forests near the railway and the best stands of cedar, velvet, oak and nut trees, were logged out for a considerable distance from the railway, and the concessionaries were obliged to expend a lot of time, energy and money for the exploration of new forest zones, prospecting and laying new and extensive railway lines, with high mountain crossings, construction of dwelling houses for employes on a large scale in uninhabited and desert districts, the organization of storehouses containing articles of daily need, the transportation of large parties of workmen and for many other requirements. General expenses and overhead charges grew accordingly, as well as the wages to the workmen. On the other hand, the Chinese Eastern Railway remained the chief purchasers of timber material, and being a commercial enterprise the railway obviously was not obliged to

consider the profits of the contractors and, therefore, in competitive biddings the railway sometimes fixed the purchase price below the cost of production.

Up to the years 1913-1914 the demand for timber materials had been quite insignificant in the local market. The money market was an extremely poor one and for this reason it was difficult to obtain longterm credit for logging operations and only granted at an exorbitant rate of interest and for small amounts. The insufficient protection against hunhutzes, especially in forest and hilly districts, remoteness from the railway, increased the difficulty of insurance of property and timber stores against fire and of employes against accidents. Insurance was either impossible or too expensive.

All these unfavorable circumstances greatly hindered the maintenance and development of the business, and therefore not only was there an absence of an influx of new funds or progress in the timber business, but many strong, private contractors were ruined. An export of timber to England gradually began to be organized in the years 1909-1914 and the prospects for big sales were very alluring, but the shortage of sea tonnage and the danger of the blockade put a complete stop to this venture in the first year of the great war.

The increased building activity in Harbin and along the Chinese Eastern Railway as well as the building activity among Russian refugees, with a large influx of gold brought from Russia, which began with the great war, tended temporarily and irregularly to increase the demand for timber. However, all this revenue brought by the war and the revolution in Russia, was soon more than offset by the tremendous losses from the depreciation of Russian currency and its subsequent complete abolition.

All the above shows that the timber industry in North Manchuria had inevitably to enter the new period, the fourth in its existence, a period of more quietly planned work with steady and increasing export and intensification of the production of dressed timber.

The previous period must be taken as a preliminary to the establishment of normal work. The time must be entirely forgotten when all lumber work was carried out by manual labor and only rough materials were produced, when even big firms could start without any steady basis, the local market possessing neither available funds, technical staff, apparatus or qualified workmen ; when everything had to be imported from far away Russia, or for Russia's account from Germany or America, when China, at her own risk, was obliged to import big parties of workmen, often losing the advances paid to them. Owing to the remoteness from industrial centers the ordering of machinery and its erection were extremely expensive in view of the absence of skilled mechanics. The delivery of machinery delayed the work for indefinitely long periods, and very often such ventures ended in failure.

The prices on timber products were also subject to violent fluctuations, the price of one cw. saqeuer (343 cubic feet) of firewood fluctuated between 12 gold roubles ($6.25) and 50 gold roubles ($26), and sleepers from 60 kopecs (31 cents) to two gold roubles and 25 kopecs ($1.15) per piece.

During the last lumbering season, the winter of 1922-23, the firm executed all orders from the Chinese Eastern Railway and prepared all necessary timber material for the local market, and it is likewise in a position to fulfill all such requirements. However, taking into consideration the yearly decreasing demand of the Chinese Eastern Railway and of the local market, the firm of V. F. Kovalsky, after investigation of the foreign markets, has been exporting timber since 1912 to Japanese and Chinese markets and the South Manchuria Railway. The scope of this business has always been determined by internal and foreign political circumstances and by the conditions of traffic.

The important increase of export and the very profitable sale of timber to remote foreign markets are especially due to the favorable political conditions, as the chief supplier of timber in the world—Russia—will not soon be able to export, whereas the supplies of Manchurian timber, particularly on the concessions of V. G. Kovalsky, are very large.

At the beginning of this article is indicated the area of the forests. The Mulin concession has been acquired only recently, and therefore lacks railways. For this reason it will not be taken into consideration in the subsequent calculation. The other concessions already provided with tracks, dwelling houses, storehouses, fire-prevention equipment and accessories, arrangements for loading and unloading, workshops and mills, possess a reserve of timber calculated at over 850,000,000 cubic feet, which would yield a yearly output of about 34,000,000 cubic feet, with a turnover in 25 years.

Proposing, as in former years, to produce not less than 30,000 cw. sagenes (10,290,000 cubic feet) of firewood and 50,000 cubic feet of sawn timber for Harbin and Fuchiatien, and for export, besides about 3,000,000 cubic feet sawn material from seven timber-sawing frames, the firm still retains an enormous quantity of timber.

An equally considerable timber reserve remains on the Mulin concession in addition to the reserves of aspen, alder, birches, etc., which have not been included herein.

Taking into consideration this enormous timber supply and the development of its exports, the firm realizes the inevitable necessity of abandoning the raw material industry for manufacturing, and therefore intends to open the following industrial enterprises :

A factory to produce glued veneer, with a yearly output of 30,000,000 cubic feet, manufactured from aspen, birch, oak and velvet wood.

A match block factory, using aspen wood, with a yearly output of 500,000 cubic feet.

Russian Far East Timber

The Far East Land Authority, after investigation, estimates that with the exception of the forest land alienated to the Buryat-Mongolia republic (amounting to five and a half million dessiatins), a total of 82,399,000 dessiatins of timber lands remain in the far Eastern government. (The dessiatin is equivalent to 117,600 square feet, or 2¾ acres.) This total includes 72,949,000 dessiatins of land covered with timber and 9,440,000 dessiatins not covered. The useful timber land is estimated at 45,688,000 dessiatins, making 55 per cent., of the total forest land and 63 per cent. of the specifically forest land. This embraces all the forests of Transbaikalia, the Amur and the Primorsk, and includes the island of Saphalien and the Kamtchatka government. It leaves out the marshland. From this data it can be seen that previous estimates which showed a total of forest land in the far eastern government amounting to 116,000,000 dessiatins, and the total useful forest land amounting to 83,000,000 dessiatins, were greatly exaggerated. The distribution of the forests according to governments and wooded area can be seen in the following statement :

Government	Timber Area Dessiatins	Useful Timber Area Dessiatins	Percentage of Timber Area
Primorsk	32,220,000	19,544,000	64
Saghalien	2,500,000	1,560,000	79
Amur	21,224,000	11,334,000	58
Transbaikalia	21,165,000	10,610,000	77
Kamchatka	5,280,000	2,460,000	4

Forest investigation and organization began in the timber lands of the far eastern governments in 1909, and continued on to 1915. Without going into the particulars per government, it is enough to say that 3 per cent. of the forest land was organized, 14 per cent. was investigated, leaving a balance of 83 per cent. not dealt with.

With the data that has just been procured it is exceedingly difficult to establish even theoretically any estimate approaching reliability of the possible annual disposal of timber materials in the forest lands of the far eastern government.

As to the more immediate position, that is, from the active point of view of the trust called the " Dalprombureau-Dalles," which exploits the Russian Far East timber lands, the export figures for last year are repeated in a general review of the Far East industrial position, showing that over three and a half million cubic feet were exported out of the country yielding an appreciable profit. But the program for the new campaign is more extensive. It is planned to produce 18,000,000 cubic feet, while it is claimed that over ten million cubic feet have already been sold for export, the buyers being Japan and China. Plans are being drawn up for a five-year program, at the end of which the production is estimated at 90 million cubic feet.—*The Timberman.*

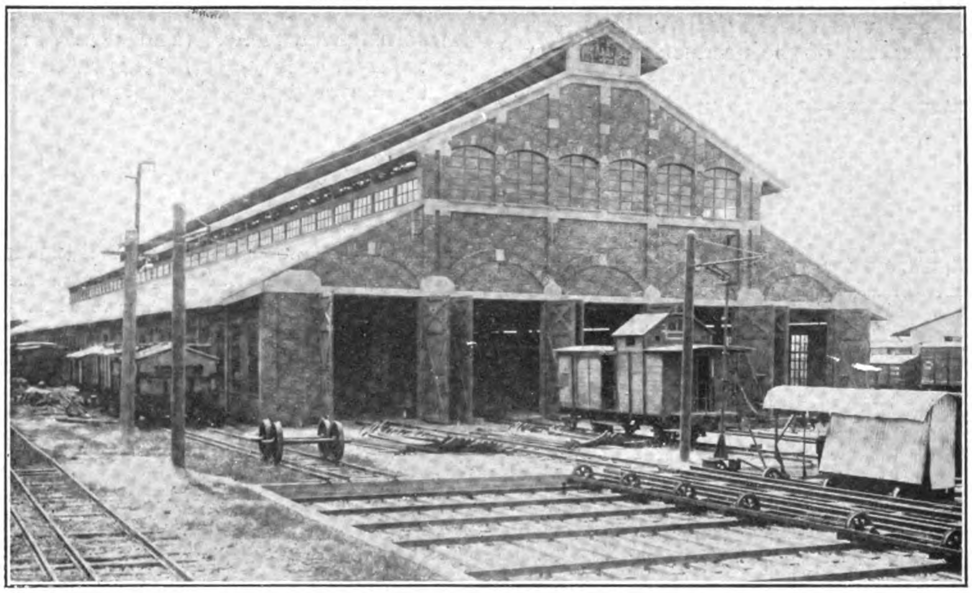
The Makasan Shops of the Siam State Railways

A Description of the Repair Facilities Provided for Rolling Stock

THE principal locomotive, carriage and wagon works of the Siam State Railways are situated at Makasan, a suburb of Bangkok on the Bangkok-Petriue line, about 5 kms. from Bangkok terminus. Here all repairs to locomotives and rolling stock, working on the east bank of the Chao Phya River (the Menam), are carried out. In addition a large quantity of new rolling stock has recently been built. This consists of new bogie passenger carriages and new goods stock; for the former the steel underframes, bogies and portion of the steelwork come from abroad and the bodies of teak are built at Makasan works. As regards the goods stock, the bodies and underframes are of teak. The bogie passenger carriages are metre gauge 18,288 m. long over buffers, 2,438 m. wide and 3,553 m. high from rail. Wagons are of 10,000 kilogrammes capacity.

The works occupy a total area of 309,616 square metres; of this the various workshops cover an area of 24,000 square metres. Employment is found for approximately 1,000 men and boys, these being chiefly Siamese with a small number of Chinese, Indians, Malays, and others.

The works are equipped with a large number of up-to-date machines, all of which are electrically driven, the majority of the larger machines by independent motors and the others in series from line shafting.



The main Workshops of the Siam State Railways at Makasan, about 5 kilometres from Bangkok. These Workshops are equipped with up-to-date machinery driven by electric power, and employ approximately 1,000 men. Besides usual repairs to locomotives, carriages and wagons and miscellaneous Railway material, new carriages and wagons are built at these Workshops.

Power House

Superheated steam at 150-lb. per square inch is generated by two Babcock & Wilcox water-tube boilers and two Cornish boilers; wood fuel is being used; the former boilers are equipped with special furnaces for burning shavings, sawdust and refuse from the sawmill.

The engine room contains two "Belliss and Morcom" high-speed vertical compound engines, coupled direct to D.C. generators, each capable of generating 435 amperes at 220 volts. In addition there are two horizontal engines, driving dynamos by belt, each generating 77 amperes at 440 volts. These four engines have one common surface condenser.

The air compressor is of the vertical two-stage type, delivering 350 cubic feet of free air per minute at 100-lb. per square inch pressure.

Provision for Locomotive Repairs

The erecting and boiler shop is 116 metres long and 42 metres wide, divided in the centre by a traverser pit. One side of the traverser pit is used for the dismantling and erecting of engines and contains 15 pits. The opposite side is used for boiler and tender repairs. The boiler repair bay is equipped with the following machine tools:—bending rolls—capable of rolling plates up to 12 feet wide and $1\frac{1}{4}$ inch thick; punching and shearing machine—capable of shearing $1\frac{1}{4}$ inch steel plate; punching and shearing machine for $\frac{3}{4}$ inch plate; 4 feet radial drill; portable pneumatic tools; tube rumbler, etc.

Each bay is served by an overhead electric traveling crane of 10,000 kilogrammes capacity. The capacity of this shop is over 40 engines per year.

The machine shop is 60 metres long and 25 metres wide. It contains close upon 100 machines of great variety, some of these are of the latest design and the following are worthy of mention:—"Webster and Bennet" 42 inches duplex boring mill, "Asquith" 5 feet 6 inches radial drilling machine, "Bateman" high speed planting machine, "Craven's" 5 feet 6 inches high-speed wheel lathe, "Craver's" horizontal boring machine, "Selson" 4 feet high-speed drilling machine, "Holroyd" 6 feet boring mill, "Beyer and Peacock" 72 inches planer grinding machine, "Holroyd" planer milling machine, "Swift" high speed lathes, "Cooper's" turret, finisher lathes, semi-automatic lathe, "Hartness" turret lathes, grinding machines. This shop is served by a $2\frac{1}{2}$-ton electric crane.

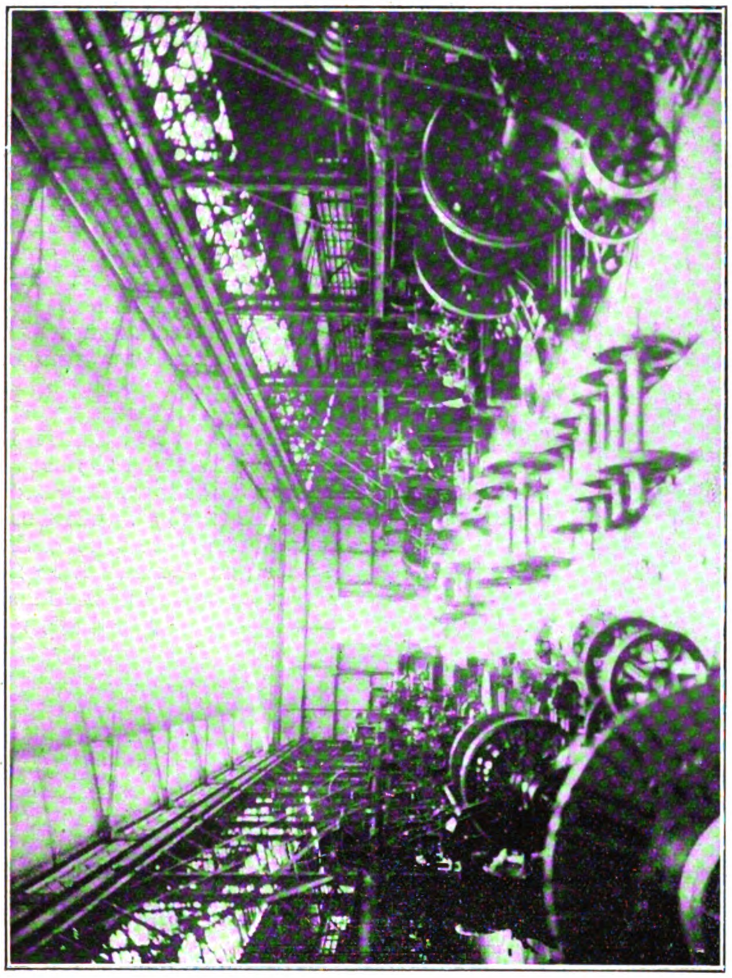
The smithy is 60 metres long and 14 metres wide and is equipped with 4 single fires, 12 double fires and 2 spring furnaces: 5 steam hammers varying from 2 to 10 cwts. are installed. The blast for the fires is generated by two 24-inch "Allday's" simplex fans, motor driven. A "Buckton" spring scragging machine is provided.

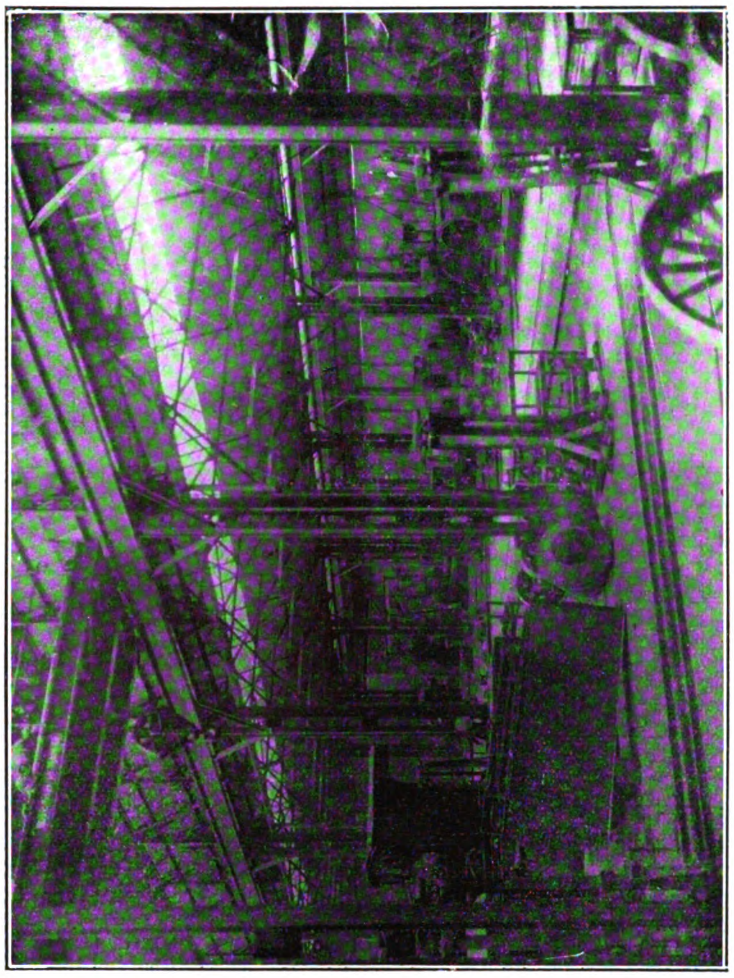
The foundry is 36 metres long and 22 metres wide and is equipped with 2 cupolas for melting iron and a battery of 3 furnaces for melting bronze, etc. One of the cupolas is capable of melting 3 tons per hour and the other $1\frac{1}{2}$ tons per hour. In addition a sand grinding mill is installed.

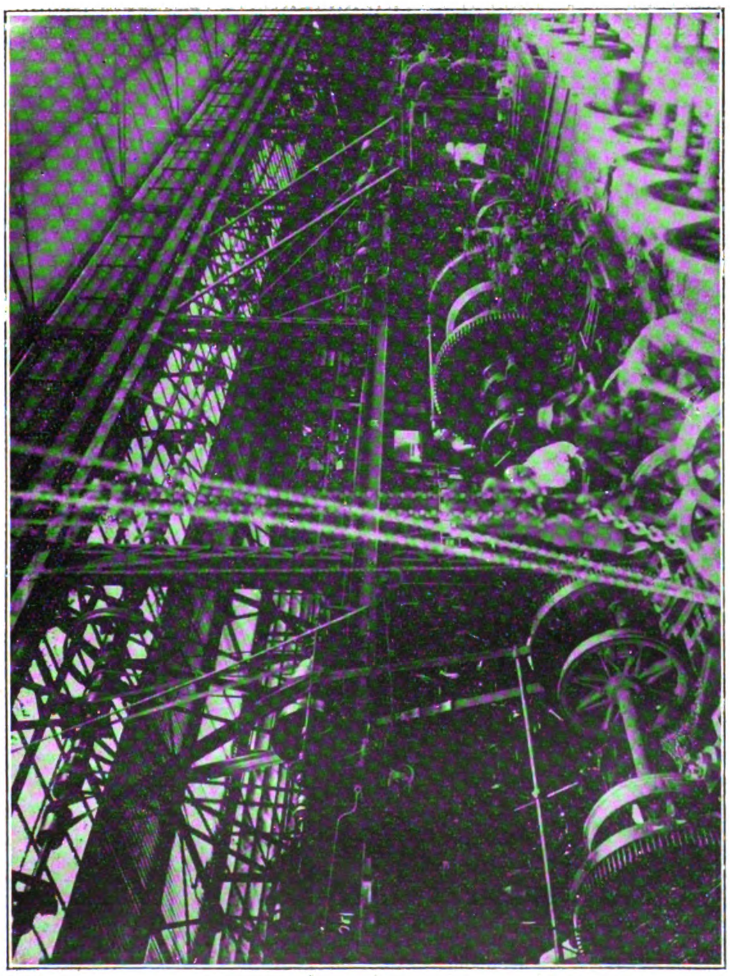
The electric, brass, wheel, welding, motor, coppersmith and outstation shops are carried under one roof, 50 metres long and 30 metres wide, portions being divided off for the various occupations carried on. With the exception of the welding and wheel shop there is no machinery of note in this building, the majority of the work being done by hand. In the welding shop a "Wilson" arc welder for 2 operators is installed and also an oxygen acetylene welding plant. The wheel shop contains a "Berry" 200-ton hydraulic wheel press.

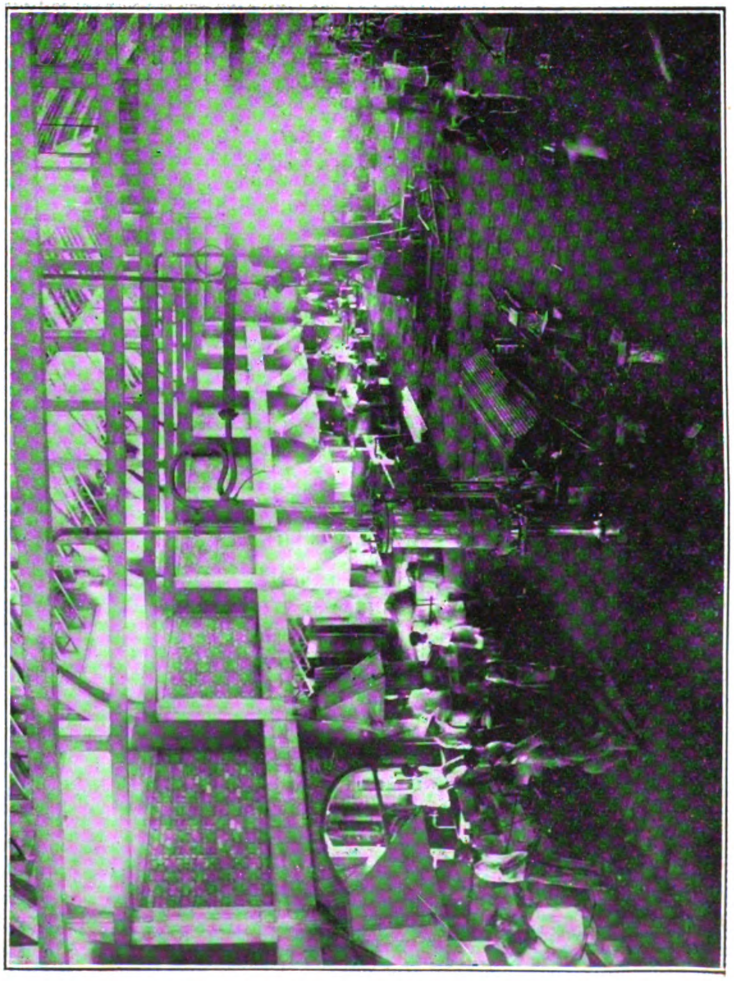
Carriage and Wagon Shops

The old carriage and wagon shop is 125 metres long and 57 metres wide, containing 17 sets of rails. One end of the shop is used as a sawmill and woodworking machine shop and the opposite end as a paint shop, the former contains some excellent examples of modern woodworking machinery made by Thomas Robinson & Son.





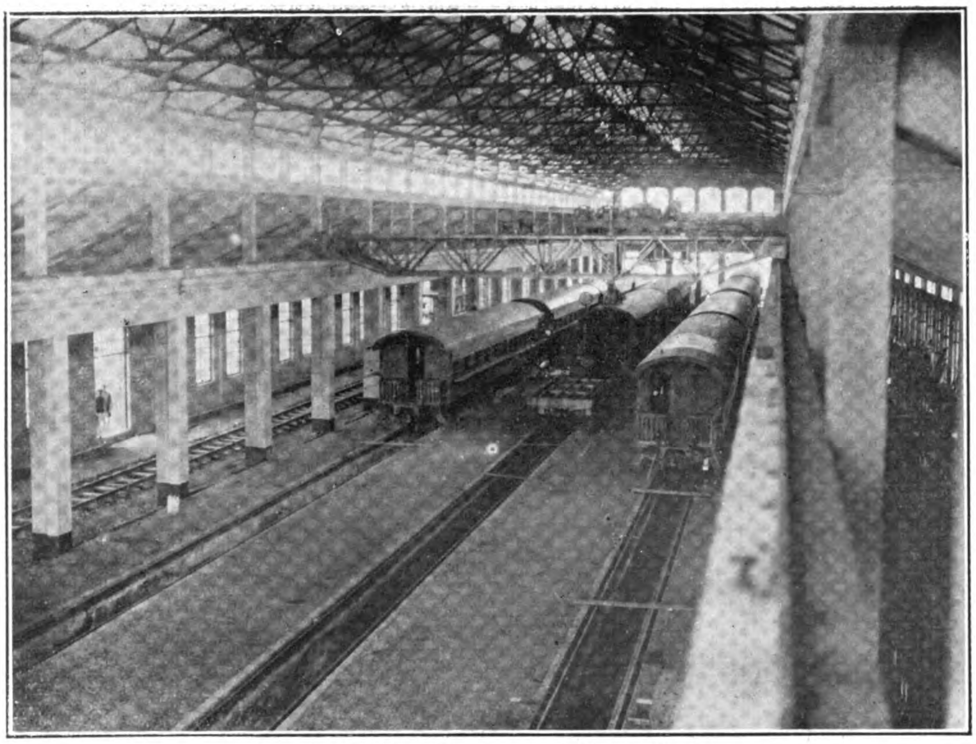




MAKASAN WORKS OF THE SIAM STATE RAILWAYS

Top: Two Views of Machine Shop Erecting and Boiler Shop

Bottom: Smithy



Interior of New Carriage and Wagon Shop

18 inches 6, 15 inches 4, 12 inches 4, cutter high-speed planing and moulding machines, duplex vertical spindle moulding machine, tennoning machine, mortising machines.

In addition to the above there are a considerable number of circular saws, hand planers, frame saws, saw sharpeners, etc., by various makers.

The centre portion of the shop is used for the repairs of carriages and wagons. The paint shop is equipped with paint grinding mills, etc. The exteriors of all passenger carriages are stained light brown and afterwards varnished with "Ningpo varnish." It has been found that this withstands the effects of the climate better than anything else, and has a pleasing appearance.

The new carriage shop is 129 metres long and 29 metres wide containing 5 sets of rails running lengthwise. The inner roads are used for building new carriage bodies and the outer roads for new goods stock. Two 15-ton "Craven" electric traveling cranes run along the centre length of the main bay.

The carpenters' shop is 30 metres long and 40 metres wide. In this shop all light carpentry, pattern making and cabinet making is done; a portion is reserved for the carriage trimmers. The shop is equipped with a few small woodworking machines, viz., chain and chisel mortiser, ripping and crosscut saw, circular saw, band saw, patternmakers' lathe, jig saw, etc.

Sterilization of Water by Chlorine

THE importance of the purity of water is well-known to be one of the most vital necessities, and as in many parts of the world it is practically unprocurable and in consequence health is menaced, the use of chlorine for sterilization purposes is coming into greater prominence.

The eighteenth annual report of Sir A. C. Houston to the metropolitan water board (London, Eng.), which has just been published, contains some illuminating figures relative to the use of chlorine in the purification of domestic water supplies.

During the twelve months, ended March 31, 1924, as much as 24,277 million gallons of Thames river water was dosed to the extent of one part of chlorine to 2.42 million parts of water. This effected a better result than storage in the Staines reservoirs for a month, and moreover, effected a saving of £14,200.

This treatment has now been applied for eight years, during which time 185,000,000,000 gallons of water have been treated with a gross calculated saving of nearly £120,000. The average dose of one part of chlorine to 2.3 millions of water produced waters from which 78 per cent. of the samples taken showed no B. coli in 10 c.c. of water.

For the treatment of new river water 5,237,000,000 gallons cost but £388, and it is stated that it is now possible to remedy bacteriological deterioration due to winter floods without giving rise to taste troubles. Chlorination effected a reduction during the flood months of November, December and January from 40 per cent. to 14 per cent. of samples containing B. coli, and this in spite of an increased general impurity of the water as indicated by the increased average raw water color from 58 to 95.

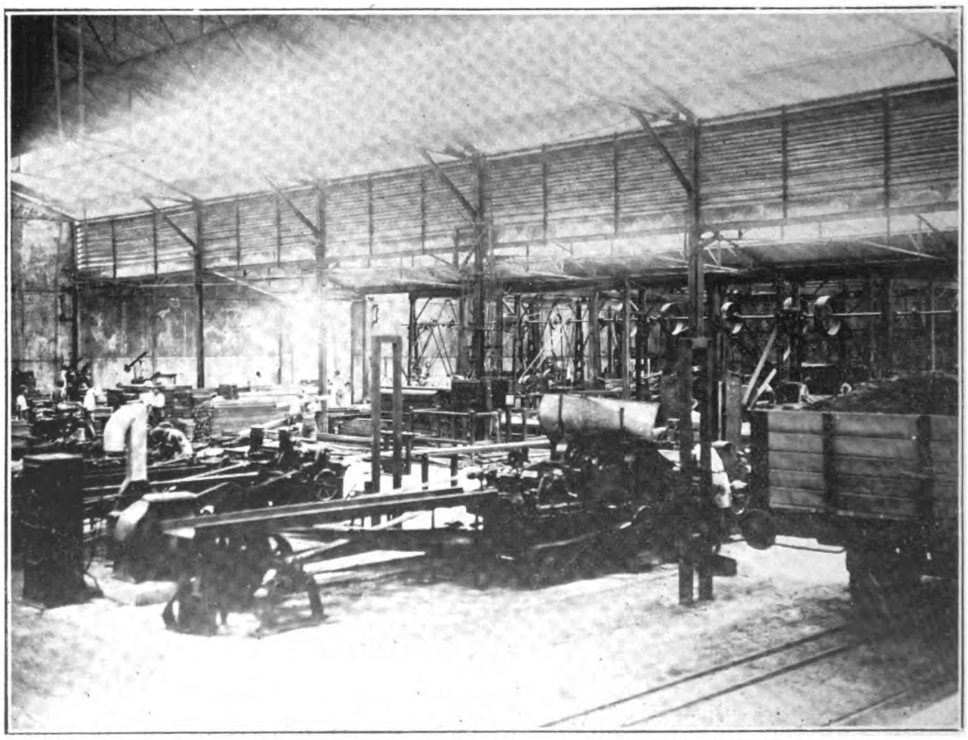
Super-chlorination followed by dechlorination has also been experimented with. Here the superdose of chlorine is 1 in 500,000. Quick sterilization is thus effected with the production of water showing no B. coli in 100 c.c., the excess of chlorine being then removed, thus avoiding the taste trouble.

This undoubted proof of the value of the system, should find a pronounced echo in the Orient, in cases where water is of inferior quality, or in any way liable to contamination.

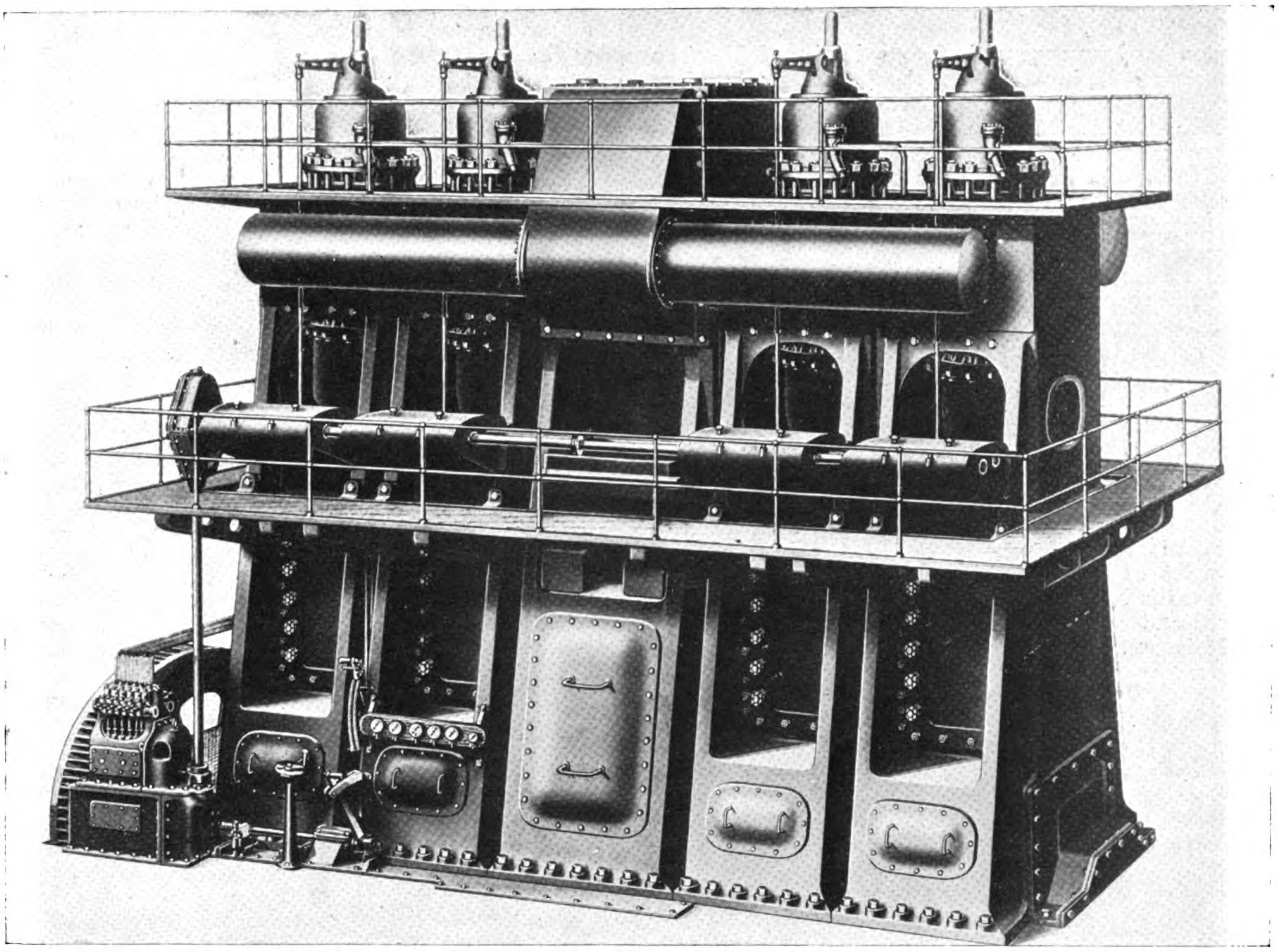
G. E. Projectors on Chinese Railways

Floodlighting projectors for use on railroad cars carrying Chinese soldiers sent out to repel bandits have just been provided by the International General Electric Company.

The floodlighting projectors were equipped with 250 watt Mazda lamps, and a considerable number of these projectors were mounted on several railroad cars used to transport detachments of soldiers. Good work was done by this means in reducing the number of bandit attacks upon railroad trains of the Tientsin-Pukow railway.



Wood-working Machine Shop. All kinds of timber is machined here for use in the construction and repair of rolling stock. This shop is adequately equipped with up-to-date wood-working machines



A Diesel Engine Achievement

American Designed Two-Cycle Double Acting Engine Marks a New Epoch in the Development of Internal Combustion Prime Movers

WE are now in a position to announce the completion of what is recognized as being the first exclusively American design of a two-cycle double acting Diesel oil engine. This new engine is the outcome of four years of intensive development work on the part of the Worthington technical staff, a prominent member of which is C. E. Jorgenson, a Diesel engineer of international reputation.

One of the outstanding advantages of this engine is that the horse-power produced per cylinder can from all indications be carried to a far higher value than has as yet been attained in any other make of Diesel engine, and this feature alone immensely increases the field of possible usefulness of this type of power producer, and renders it an active competitor of steam-driven power machinery throughout a much wider range than has heretofore been found possible.

This new Diesel Worthington engine was wholly designed and built in America. Behind it is the Worthington's twenty-four years of experience in designing and building internal combustion engines the last four years of which, as intimated above, have been applied to intensive research, study and experiment aimed directly at the production of the results which have now been realized. Dr. C. E. Lucke, professor and dean of mechanical engineering of Columbia University, N. Y. City, U. S. A., who has been in touch with the development of this Worthington engine, has made the following statements relative to same :—

" It is a new Diesel engine design. Previous types of Diesel engine started with an engineering idea which was embodied in an engine. This one started with an analysis of the practical requirements of the ship, followed by a deliberate purposeful effort to create an engine to meet those requirements.

" The requirements were,—an engine of minimum cost per horse-power to build,—one that would fit into engine-rooms that had been built for steam machinery, without too much reconstruction,—and one that would run at about the same speed as the steam engine, and hence use the same shaft and propellor.

" The answer to these problems is known as a double-acting two-cycle Diesel engine. Without going into technicalities, this means that whereas previous types of Diesel engines installed in ships deliver power, in the four-cycle single-acting type on every other down stroke of the piston, and in the two-cycle single acting type on every down stroke,—this engine delivers power as a steam engine does, on every down stroke and every up stroke.

" It is easy to see that to get the same amount of power from an engine cylinder in which the power is delivered only one-fourth of the time, it must be larger than one in which power is being exerted all the time,—and the engine including this cylinder and its accompanying mechanism will cost much more to construct. The difficulties in the way of earlier adoption of this double-acting idea were largely due to the heat generated in the cylinder, which is very great in large engines, so great as to require special provision to prevent injury by overheating the cylinder.

" To tell how the difficulties of incorporating these ideas into a practical engine, were overcome, would make a story too long and too technical to be told now. Suffice it that the Worthington corporation, which built the first Diesel engine in America—twenty

years ago—has evolved a wholly American design that overcomes these difficulties."

Worthington has been engaged in the production of American Diesel engines since 1912, in which year the first wholly American design of engine of this type was developed in the company's works at Buffalo, N. Y., U. S. A. Nearly 100,000 horse-power of Worthington Diesel engines are now in active service in the United States. The Worthington type of gas engine has been in use since 1900, and at the present time over a quarter of a million horse-power of such engines, including the largest double acting gas engines ever built anywhere, are in use.

The principal inspiration back of the four years research campaign recently concluded was that there had grown up a strong demand for a new type of engine that would overcome the numerous handicaps inherent in the character of existing Diesel machinery. The problem placed before Worthington engineers was to produce an engine possessing all the advantages of the Diesel engine as regards fuel consumption and general operating economy, and which at the same time would approach in dimensions, weight and speed close enough to steam-driven machinery to permit of its substitution for steam engines in ships that had already been built and at costs that would not be prohibitive either for the engine or for the installation.

Another point of great importance also was the matter of manœuvring qualities. A marine engine must be capable of being started, stopped and reversed quickly and with ease and certainty of control. It is well known that the last mentioned qualities constitute the reasons why the reciprocating stream engine has so long held its ground in competition with both the steam turbine and the Diesel engine for ship propulsion.

The basic principle underlying the new Worthington Diesel engine in comparing same with the current types of four-cycle and two-cycle engines, is that whereas in the first type there is only one power stroke in every four strokes made by the engine, and in the second case only one power stroke for every two strokes of the engine, the design of the new type of Worthington Diesel engine is such that every stroke of the engine is a power stroke. Therefore its working cycle is very much the same as that of a reciprocating steam engine.

While this principle is not entirely novel its successful application has hitherto been interfered with by mechanical difficulties caused by complicated heat stresses that are present in the cylinders of double-acting Diesel engines. Consequently the success of the new Worthington design is wholly based upon the manner in which the problems of expansion and of heat removal have been solved therein.

The complete solution of this problem having been accomplished, the extraordinary advantages of the double-acting type of Diesel engine are at once brought out in greater prominence. The serious difficulties heretofore encountered in satisfactorily balancing the moving parts of the engine are thereby entirely removed. The saving in weight of moving part by distributing the power development through four strokes instead of concentrating same in one stroke is an important improvement also, because of the decreased provision needed to care for the momentum of these parts.

The cylinder of this new Worthington Diesel engine may be described as composed of two single-acting cylinders opposed end for end, the power in each being exerted in opposite directions upon a double end piston which is flanged to one rod. Scavaging and exhaust ports, cooling water circulation and expansion provisions of the two cylinders are independent of each other. Thus it will be seen that the design is exceptionally simple and follows in all respects the best modern standards in Diesel engine practice.

The plan adopted for insuring the maximum strength and rigidity in cylinder construction, combined with the necessary freedom for expansion and uniformity of heat transference as well as constructive economy in the use of materials, are especially simple and effective. There are three fuel spray valves, one being located on the top of the upper end of the power cylinder, and the other two being located in the lower end of the power cylinder. Great ingenuity is shown in the admirable manner in which the two latter valves are operated in providing a uniform and symetrical distribution of the fuel discharge around the piston rod.

The reversing mechanism, as a point of interest, is second only to the unique cylinder design. Each of the three fuel valves has its individual cam and all three are geared to the same shaft. The cams are symetrical. All that is necessary to reverse the running direction is to shift the three cams simultaneously through 34 degs. on the shaft. This is accomplished by a worm shaft which is actuated by an oil operated mechanism controlled by a 4-way cock, this in turn being operated by a single lever on a manœuvring platform.

The engine is started and stopped by this single lever which as it is moved forward opens successively the air starting valves, and then the fuel supply valves, while simultaneously closing the air starting valves. The lever can then be set by a ratchet and pawl at any desired rate of fuel supply. To stop the engine, all that is necessary to do is to throw back the lever mentioned to the stop position. The starting and stopping lever and the reversing lever though independent of each other in all other respects, are interlocked so that the engine must be brought to a full stop before it can be reversed. The manœuvring control is therefore as practical, simple and effective as in the case of the reciprocating steam engine, and it is much more prompt and positive than it is in the case of a steam turbine. The possibilities of this positive, quick-operating reversing gear appeal to marine engineers almost as strongly as the important improvements that have been made in the cylinder construction as described above.

In keeping pace with the development of the Diesel-engine driven ships versus those of the steam-engine driven type, almost insuperable difficulties have heretofore been encountered in efforts to change over existing vessels of the latter type to Diesel drives. The advent of the new Worthington Diesel engine has created a totally different situation in this respect. Heretofore the great weight, the space occupied, the cost of existing types of Diesel engines for ship propulsion and a lack of manœuvring qualities have had the effect of rendering the margin of operating profit resulting from conversion so low as to provide very little inducement to the investment of capital in such conversions.

In most cases the cost of removing the steam machinery, the first cost of the Diesel engine, the possible sacrifice of cargo capacity and the cost of more or less extensive changes in the ship's structure acted as serious deterrents against the conversion of steamships into Diesel ships.

Worthington engineers believe that all of these difficulties have been completely overcome by the evoluting of an engine having the fuel economy and other operating advantages of the Diesel oil engine, and in which at the same time are embodied the simplicity of design, the lower first cost, the moderate weight, the economy in space occupied, and the facility of manœuvring control that are possessed by the best type of steam-driven reciprocating engines. This means then that the conversion of steam-driven ships to Diesel-engine driven ships can now be easily effected without any important changes in the ships themselves, in many cases without even changing the existing shaft and impellers, and often with an actual increase in cargo space.

One of the first effects of the advent of this new Worthington Diesel type of engine will be the strong impetus that is thereby made possible in converting and placing into the world merchant marine trade over a thousand American ships originally designed for steam-engine drive, and that are now laid up in idleness because they cannot be profitably operated under present conditions.

The usefulness of the new Worthington Diesel engine will by no means be confined to shipping however. The same simplicity of design in larger sizes are expected to commend them for many uses on land in isolated power plants, in pumping stations in various industrial plants, in supplementary or "stand-by" power plants needed on hydro-electric service when water supplies run low at certain seasons of the year, etc.

This new double-acting Diesel engine, especially adapted as it is to building in larger sizes, renders it possible now to realize in the larger installations the same advantages and economical value that the smaller sizes of Diesel engines operating "single acting" have already so conclusively demonstrated as practicable.

The concensus of opinion on the part of engineers who have investigated the subject is that in the design and construction of this new type of Diesel engine, Worthington have inaugurated a new era in the production of power by Diesel engines, the influence of which it would seem is certain to have a world-wide effect.

D. J. GIBSON.

Mining Progress in N.E.I.

THE jurisdiction of the Netherlands East Indies bureau of mines extends over the following activities, geological surveying, vulcanology, prospecting for useful minerals, carrying on researches of mineralogical and metallurgical nature, locating and sinking wells for drinking water in deep layers, organizing and managing state mining industries and exercising regular legal supervision of private mining enterprises. The government mining industry includes the collieries at Sawah Luntoh, at Tandjong (Sumatra) and at Pulu Laut, an island off the south-east coast of Borneo, further the tin mines on the island of Banka and the gold and silver mines in Benkulen (Sumatra).

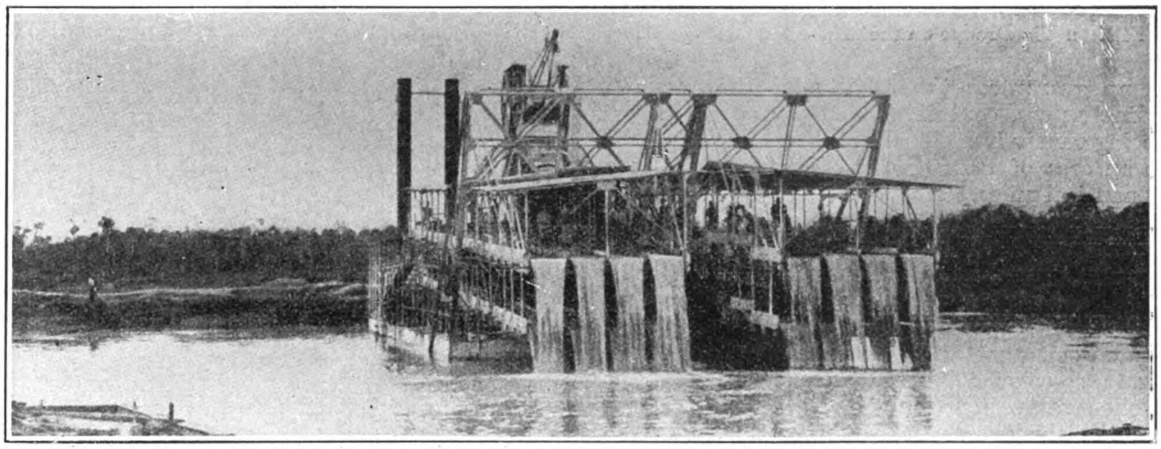
Private concerns, wishing to exploit minerals, must obtain a license to prospect a concession; both these are subject to certain conditionsregarding domicile of the owners during the concession period, government taxes, security, transfer and government supervision, set forth in the mining act of 1898, as revised in 1910 and again in 1919. According to this latest revision, aside from rights already granted, no more concessions will be granted to private individuals for anthracite and all kinds of bituminous coal and lignites, petroleum, asphalt and all other kinds of bituminous substances, solid as well as liquid, and inflammable gases, the latter as far as they are not of recent origin marsh gases and also iodine and allied substances obtained from salt deposits or mineral springs.

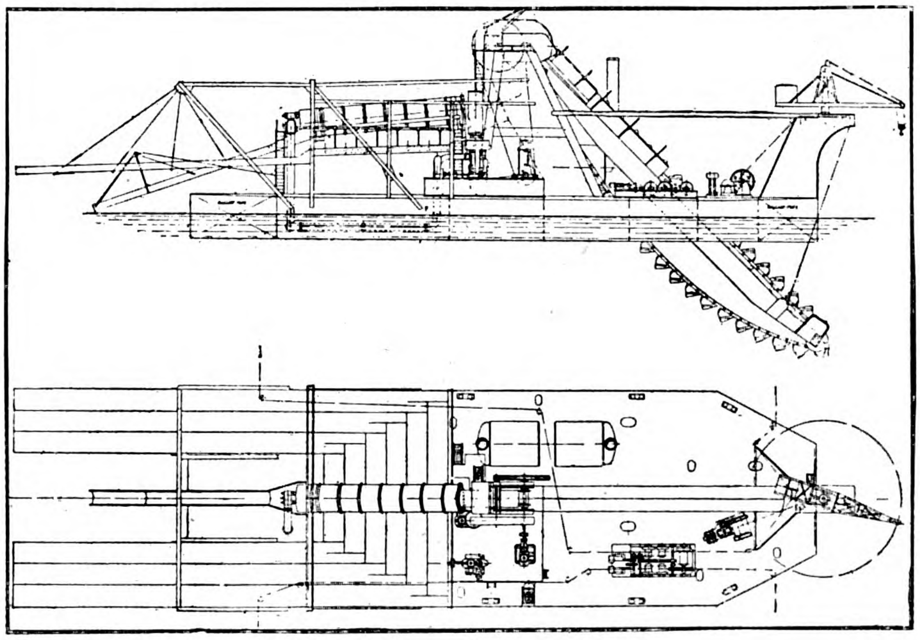
The minerals named before may henceforth be exploited only by the state itself, or by private parties in possession of an exploitation agreement with the government, on the basis of article 5a of the Dutch East Indies mining act, which agreement may only be signed by power of attorney fixed by law.

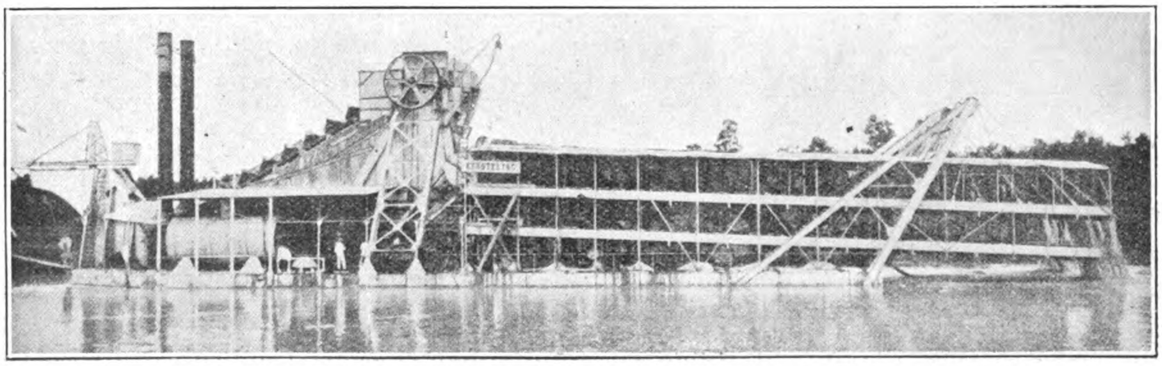
Concessions for the remaining minerals are still granted on the old basis. The working of minerals not mentioned in the mining act, is also subject to a permit.

Connected with the head office of the minirg service in Batavia is the mineralogical and geological museum of the East Indian archipelago, to which anyone, interested in the work, may obtain admission on application. There also, assays of minerals and ores are made for private persons.

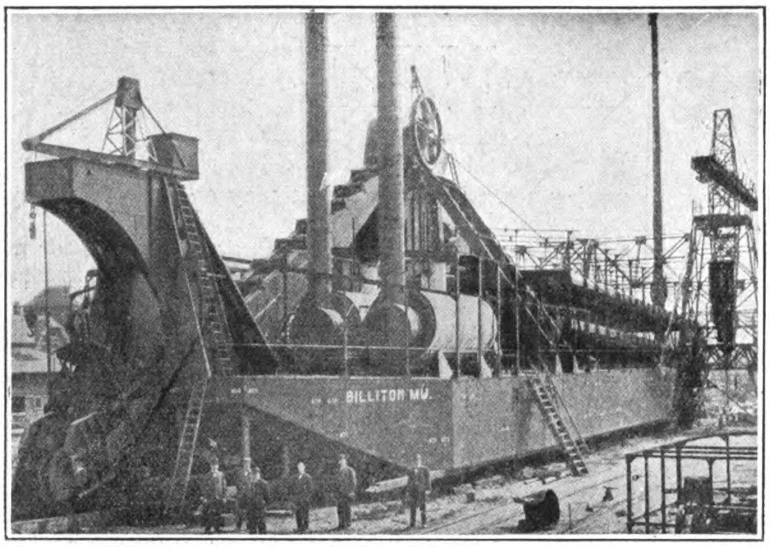
The government tin mines, all of which are situated on the island of Banka, are the outcome of an agreement made for the supply of tin by the former East Indian Company with the Rajas of Palembang, who, in those days, owned the island. The mining, which probably dates from 1710, was first carried on by the Malay population. Soon, however, the Chinese took the industry in hand; in 1820 it was placed under European control by the Dutch East Indian government and since 1852 has been supervised by mining engineers, trained in Europe. Originally these engineers were entrusted only with the topographical, geological and mineralogical survey of the island, but they have since been put in charge of the actual mining and smelting operations. They have introduced important improvements in the construction of smelting furnaces, the drainage of the open cuts and the stripping of the overburden, so that the tin industry at Banka is now entirely up to date and is making use of the latest technical inventions. Moreover during the past few years the tin has been subject to a chemical test, before being exported, so



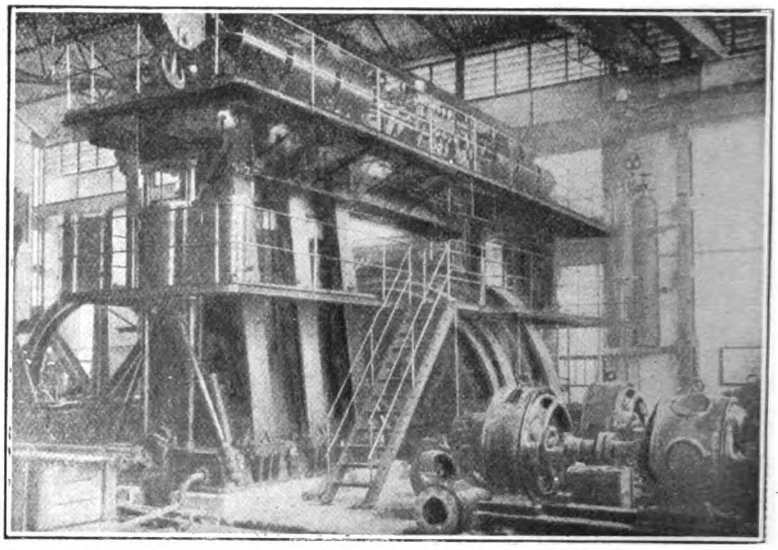




Type of Tin Dredge Employed on the Billiton Mines of the N.E.I. Government



The Billiton Tin Dredge on the Slipway



Diesel Motor in the Manggar Electric Power House of the Billiton Mines

that the Banka stamp guarantees the quality of the product. Banka tin is exceedingly pure, containing 99.9 per cent. tin and more, the balance being chiefly iron.

The island has an area of 12.240 square K. M. and extends over a length of 100 nautical miles. Most of the mines are situated on the north-east side of the island. The ore, which is found in the alluvial deposits of many riverbeds and in the alluvial strata on the slopes of small hills, is worked exclusively in open cuts. The deposits of some riverbeds extend for considerable distance into the sea, and accordingly some workings extend beyond the coast, this kind of exploitation being one of the interesting problems for the future. The strata, so-called "Kaksa," from which the ore is obtained, are from one-tenth to four-tenth metres thick, although in exceptional cases the thickness reaches several metres. The overburden ranging from about 5 to 20 metres, is chiefly removed by hand with the aid of mechanical transport or hydraulic sluicing, the latter being considered best for soft layers. This sluicing is aided by gravel pumps, partly of N. E. I. design, about 200 of which were in regular service in 1922, 66.87 per cent. of the excavated ground being handled in that way. A steam turbine driven by electric power plant of 6,000 kw. is installed for distributing power to the most important districts. The ore is first washed in sluices and is then generally smelted in simple blast furnaces called "Vlaanderen ovens." Each district has a central smelting-house for all the mines.

The manual labor is still done by Chinese coolies and is partly contracted for and partly carried out under the government's own management. In 1922, 13.5 per cent. of the world's tin production was obtained under government supervision. The average number of laborers (contract coolies) in 1922, amounted to 18.061. Since 1914 Banka tin has been sold almost exclusively in the Dutch East Indies. The tin is sold by private contract in Batavia, while a small part is supplied to various branches of service in Holland and the Dutch East Indies. The following table gives some figures regarding the tin industry in Banka :—

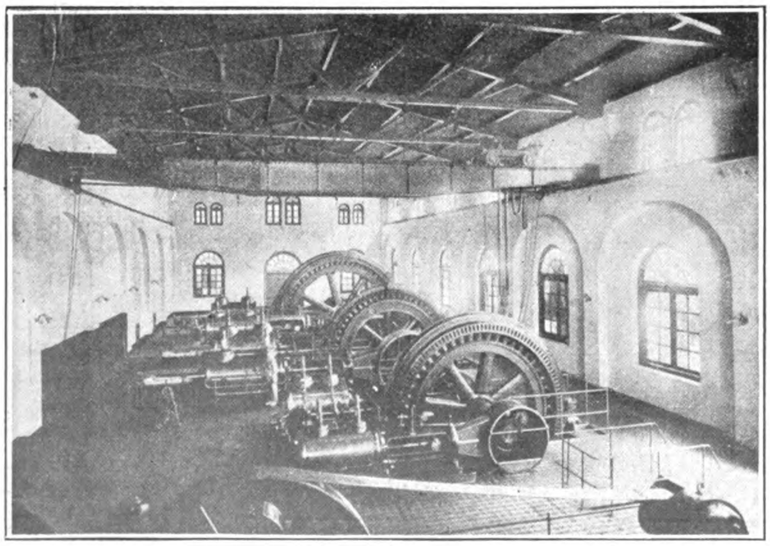
Year	Number of Mines	Average Number of Laborers	Production in Tons of 1,000 kg.	Quantity of Tin Marketed in Holland in 1,000 kg.	Quantity of Tin Sold in D. E. I. in 1,000 kg.	Cost Price of the Marketed Tin per picul in Glds*	Average Selling Price in Glds. In Holl.	Average Selling Price in Glds. In D.E.I.	Nett Receipts of the Marketed Tin in Glds.	Nett Profits of the Industry in Glds.
1919	311	18,129	12,404	904	15,254	63.01	182	176	46.227,847	29,682,893
1920	320	19,718	13,590	12	9,489	83.27	194	194	29,925,717	17,114,672
1921	324	19,254	15,142	—	13,971	93.00	—	113	25,685,458	3,308,602
1922	336	18,061	17,073	—	—	—	—	—	—	—

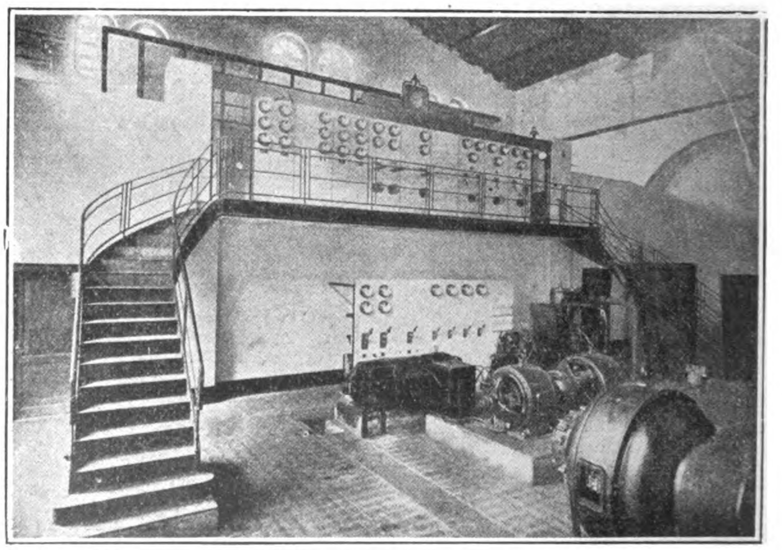
*[1]Freight and selling costs included.

The chief private tin mines enterprise is that of the "Billiton Maatschappij," which works the tin in the island of Billiton. In 1852 a concession was granted to the Billiton Maatschappij, and in 1892 was extended for a further period of thirty-five years. In the new agreement it is stipulated, that five-eights of the yearly profits goes to the government.

The geological formation and deposits of the ore are almost similar to those in Banka. In Billiton, however, are also found ore veins, which are rich enough to be worked, in alluvial deposits.

As in Banka, the work is done by Chinese "kongsies," working under contract, while the industry is organized along the same lines. Besides the regular manual labor and thereby appertaining mechanical appliances, also four suction dredges and one bucket dredge are in regular service. About ⅗ of the tin is mined by hydro-mechanical means. An electric power plant, driven by Diesel engines, generates the necessary power. In 1921 twenty six mines were in exploitation. As the date of expiration of the concession is approaching, a proposition has been made for passing a law entailing further exploitation of these tin mines for joint account with the government.



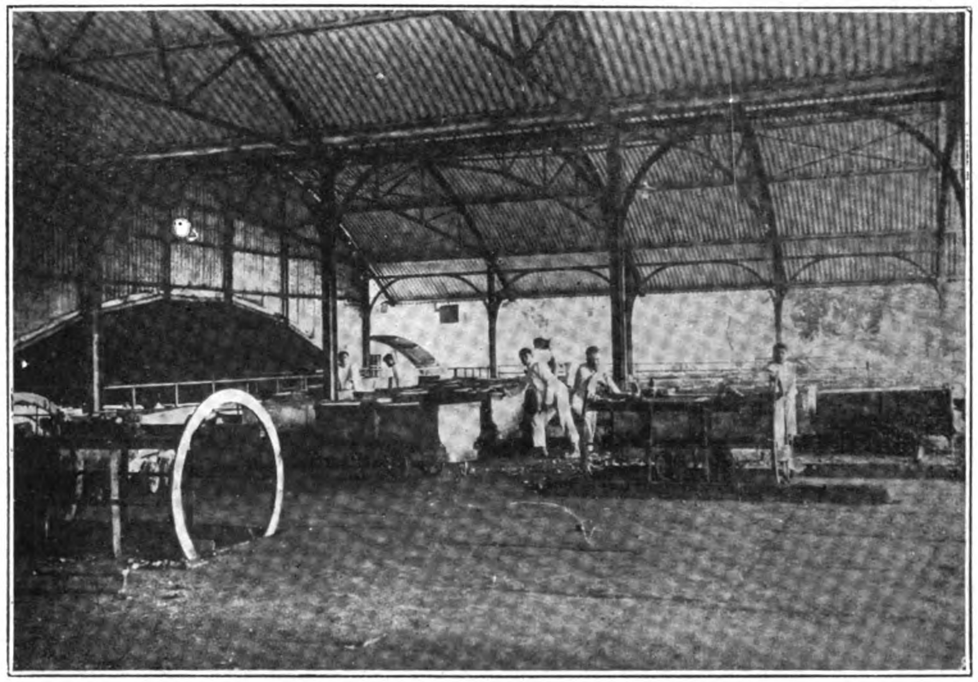


Generating Room and Switchboard of the Sawah Loento Power House

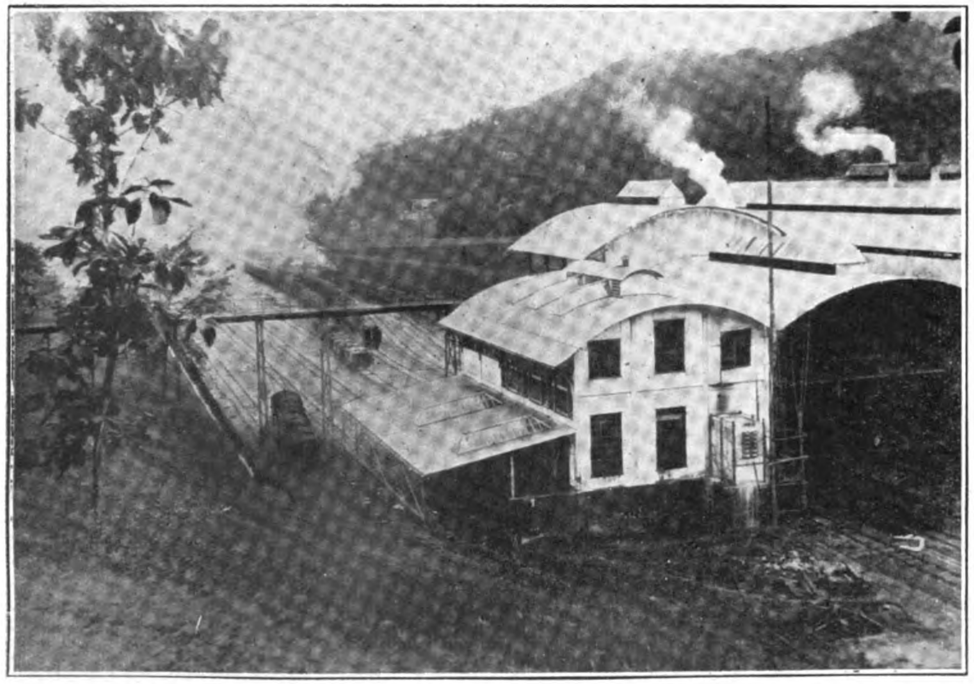
THE OMBILIN COAL MINES AT SAWAH LOENTOE, SUMATRA

Operated by the N.E.I. Government and Producing Over 500,000 Tons Annually

Electric Power Station

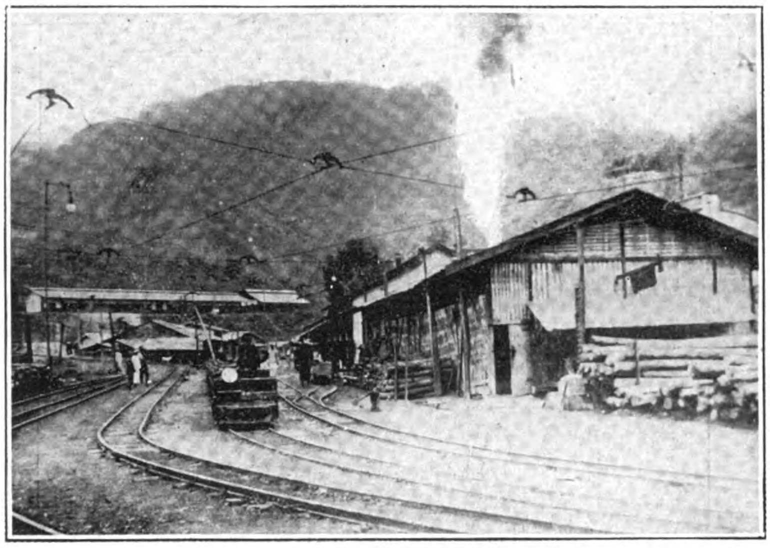


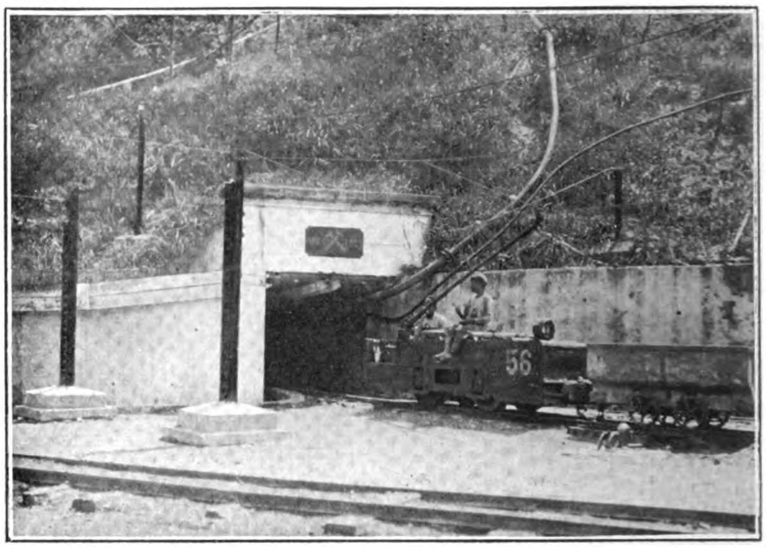
Interior of Coal Dressing Plant



Briquette Factory and Coal Dressing Plant

Cable Tramway at Mine





Electric Locomotives at the Ombilin Coal Mine in Sumatra

Another private enterprise is the " Singkep Tin Company," to which a concession was granted in 1889 on the island of that name in the Riouw archipelago. The ore deposit is similar to that in Banka and Billiton and the mines are worked almost according to the same system. In the hills the ore is also mined by tunnels. Near Singkep tin ore is also found at the bottom of the sea, where it is worked by means of bucket dredges. The Singkep ore is smelted in Singapore.

The following statistics regard both these companies :—

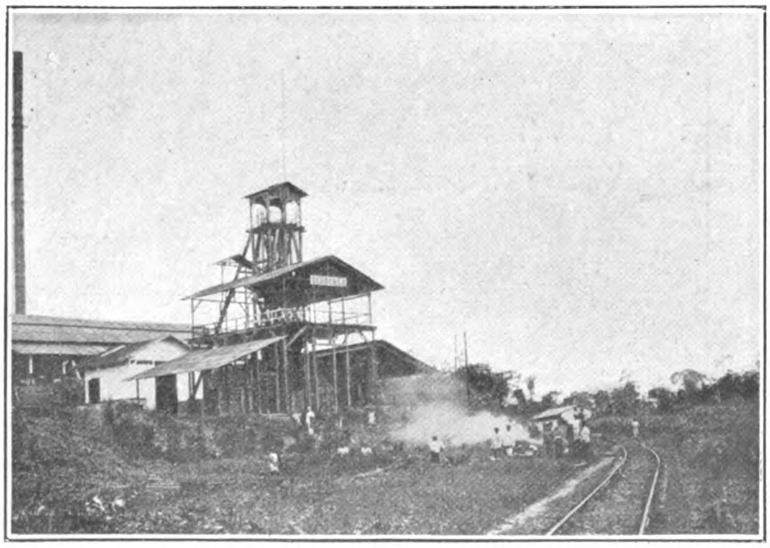
	Billiton Company		Singkep Company
Year of Report	Production in Tons (100 k.g.)	Share of Profits Paid to the D.E.I. Government in glds.	Production in Tons (1,000 k.g.)
1919	7.835	4.599.829	729
1920	7.677	2.560.577	618
1921	11.533	nihil	719
1922	10.793	data not available	672

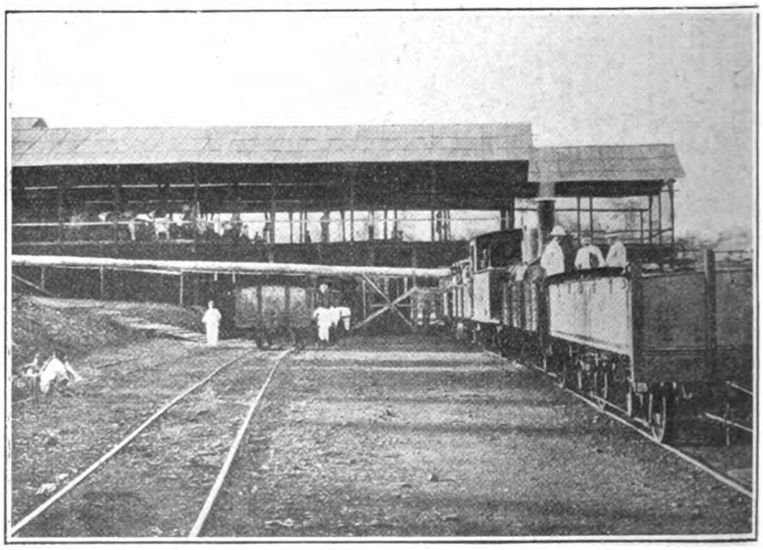
There are now three government coal enterprises : the Ombilin mines, the mine at Pulu Laut and the Bukit-Asem mines. The Ombilin mines are situated near Sawah Lunto in the Padang highlands, a region very famous for its beautiful scenery. Mining was started in 1892. For transport, a railway, 156 k.m. in length, was constructed. Owing to the hilly nature of the country, parts of the track are constructed as rackrail. The coal field extends for 10 k.m. in length and has a width of 9 k.m. The thickness of the seams varies, but is usually very great, some seams being as much as 12 metres wide. The coal in sight is estimated at 200,000,000 metric tons, of which a total of 7,291,425 tons was excavated from 1892 to 1919. The coal burns easily with a large, clear flame and only small quantities of ash. The mines so far have been worked entirely by means of tunnels with the aid of all kinds of modern technical machinery. Formerly the greater part of the production was sold to private buyers (in 1913 80 per cent., in 1914 76 per cent. of the total output), but during the years of war, on account of the stagnation of foreign shipping, the government public services were supplied to a greater extent ; in 1916 : 28 per cent. ; in 1917 : 47.5 per cent. ; in 1918 : 48.62 per cent. ; in 1922 : 53.90 per cent. The coal, sold to private buyers, is partly taken in at Emmahaven (Padang) as bunker coal, partly shipped as freight coal to Tandjong Priok, Sourabaya and Macassar, where it is reshipped as bunker coal. In order to supply the need for coal in the archipelago during the years of war, the production was raised as high as possible and as far as available means allowed.

The laborers consist for the greater part out of convicts and Javanese contract coolies, the rest being made up out of local labor. At the end of 1922 the total number of laborers amounted to 9,396, among which were 4,822 convicts. On account of the continuous changing of these latter, the output per capita is very low. The hygienic conditions are generally favorable among the laborers ; the mortality resulting from sickness amounted to 1.4 per cent. among the Javanese contract laborers and 2 per cent. among the convicts. The death rate resulting from accidents amounted to a total of 2.65 per cent. in 1914, against 1.59 per cent. in 1917, 0.74 per cent. in 1918 and 1.09 per cent. in 1922.

An electric power plant provides the necessary power for the pumping machinery, underground transport by electric trolley locomotives, screening house, etc. Exploitation is carried on stopes, combined with hydraulic stowage. The following figures relate to the government coal mine :—

Year	Production in Tons (1,000 k.g.)	Book Value of the Enterprise in Glds.	Receipt in Glds.	Working Expense in Glds.	Net Profits After Deducting Share, Paid to the Sumatra R.R. in Glds.
1919	510,821	5,336.609	7.100,512	5,569,556	1,320,163
1920	567.142	7.194,842	12,792,718	7,803,656	4,658,441
1921	602,853	8,411,202	13,758,338	9,108,478	4,252,924
1922	544,002	—	7,976,402	—	—





Shaft No. 3 and Loading Station at the Poeloe Laoet Coal Mines in East Borneo

On the island of Pulu Laut, off the south-east coast of Borneo, a colliery has been worked by the government since October 1, 1913. The whole island is reserved by the government for mining and geological research. The centre of the coal industry is at Stagen, connected with the harbor by a railway of five kilometres. Mining is carried on in two seams. The island is favorably situated for the sale of its product, being in the direct route of shipping between South Africa, Australia, Java and Macassar, with China and Japan. In 1922 some 110,660 tons of coal were shipped, of which 37.5 per cent. was delivered to private parties and 62.5 per cent. to government services and industries. The work is chiefly done by Javanese contract coolies, the average number of which in 1922 amounted to 2,117.

The production from 1907 to October 1913, amounted to 902,295 tons, but reached 180,159 tons in 1919, 188,772 tons in 1920, 208,900 tons in 1921 and 113,218 tons in 1922.

The third government coal mine, Bukit Asem, is located near the dusun Tandjong, 12 k.m. south-west of Muara Enim in the Residency Palembang. For a long time various explorers had reported that coal was found in the highlands of this province but little attention was paid to this fact, because the mineral was brown coal. Owing to the proximity of volcanic rock (andesite), however, the coal at different places is metamorphosized into a superior quality. The geological research of 1915 proved that great quantities of this superior quality of coal were present near Tandjong. Firing tests gave favorable results, so, owing to the coal shortage in the Dutch East Indies and to supply the government railroads with necessary fuel, it was decided to start a mine on a small scale by way of experiment. The coal produced was at first transported from Tandjong to Muara Enim on a light railway, constructed in a short time by the government railway service, loaded into the cars of the South Sumatra government railway and conveyed to Palembang (Kertapati), where it was shipped in cargo steamers.

The better class coal is found in three seams, the upper, so-called Mangus seam, consisting of two banks 6 and 7 metres in thickness, intersected by a tuff layer from 4 to 5 metres thick, the middle so-called Suban seam, consisting of two strata of 8 and 3 metres, intersected by a stratum of clay 2 metres thick and the lower Petai seam from 6 to 8 metres in thickness. The seams are separated by clay shales and sand, from 15 to 25 metres thick. A fourth seam also occurs, the Merapi layer, at a depth of about 200 metres below the Petai seam. The coal is very pure, containing not more than 3 per cent. of ash, mostly but 1 to 2 per cent., but some kinds show an inclination to friability. During an optional contract closed by the government with the owners of the Lematang concessions, situated in this region, these concessions and the adjacent grounds were investigated. The result of this investigation was, that in 1919 the concessions were taken over by the government.

At present three kinds of coal are marketed: (1) Lematang marine coal with the qualities of semi-bituminous coal *i.e.*, fixed carbon 58-60, volatiles 36-38, moisture 2-5 per cent., ashes 1-3 per cent. and caloric value 13.000-14,500 B.T.U; (2) Bukit Asem coal, with all the qualities of the bituminous coal averaging say 12,000 B.T.U; (3) Briquette-coal of the semi-bituminous type with low volatiles and the average analysis of fixed carbon 80, volatiles 17, moisture 1, ash 2 pei cent. and cal. value 14,500 B.T.U.

The coal is at present screened on grizzlies and separated in lumps and small coal (0-30 m/m); during this year a large screen-house will be put to work for producing in future lumps (larger than 30 m/m), nuts (10-30 m/m) and fines. Modern equipment, including an electric power plant, screenhouse, etc., will shortly be started to work. Underground transport will be done by compressed air locomotives. The production amounted in 1917 to 9,764 tons, in 1918 to 50,300 tons, in 1919 to 106,881 tons, in 1920 to 141,618 tons, in 1921 to 172,939 tons and in 1922 to 113,481 tons.

A mineralogical—geological research, instituted by the government, proved the existence of two gold and silver deposits of commercial value: Tambang Sawah and Lebong Simpang, both located in the district Lebong in the Residency Benkulen. The Tambang Sawah deposit chiefly contains manganese-bearing refractory silver ore, which will be worked according to a process discovered by the Engineer Caron. Owing to war conditions the necessary tests on a large scale could only be made in America, where they took place in the station for metallurgical research at Golden near Denver, with the co-operation and instruction of Professor Clevenger of the United States bureau of mines. An installation for a daily production of 150 tons has been installed lately.

During the time the tests were made, preliminary work was already carried out on the spot, while a road connecting the mine with the principal town of Muara Aman was constructed by the service of public works. The service of waterpower and electricity built an electric waterpower plant at Tais to supply the mine with electric power. This power plant will also provide more power to the adjacent Redjang Lebong mine. The work at Lebong Simpang was started in 1920 with a small plant. The power is supplied by a small waterpower station. In 1922 the production amounted to 70.5 k.g. of gold and 26.4 k.g. of silver.

From ancient times the Dutch East Indies had the reputation of being rich in gold, Java included, though this is the only island where no gold mines are found, the metal being found only rarely. At the end of the last century private enterprise discovered a number of places where gold was found, the result of which was that several mining companies were floated. The record of these companies on the whole has been unfavorable, but gradually sounder conditions have arisen. Gold is found in Sumatra, Borneo and Celebes in all kinds of deposits, such as alluvial deposits, tertiary gravel beds and as lode deposits. At the end of 1922 for the mining of gold and silver, 72 concessions had been granted.

The mining of the alluvial beds so far has been of small importance and dredging accordingly has met with little success. Natives are employed in the washing of river sediment. The more important mining companies confine themselves exclusively to the working of lode deposits. The greatest quantity of gold and silver is produced in the Residency Benkulen in Sumatra, where two mines are at present in exploitation and in the Residency West Coast of Sumatra, where one mine is at work.

The mining area, known by the name of the Lebong district (Lebong mine), is situated about 75 k.m. north of the capital and harbor of Benkulen, the Mangani mine on the west coast of Sumatra is situated near Pajacombo to the north of Fort de Kock. The veins sometimes extend as far as 4 k.m. Waterpower is everywhere available for the working of the ore. Another gold-mining district is to be found in the northern peninsula of Celebes, which, however, so far has failed to come up to expectations. At the present time there are three mines working. A third gold centre is located in Central Sumatra near Padang, where the mines have been producing since 1913.

Among the other minerals found in the Dutch East Indies, besides petroleum, mention should also be made of iodine, wolframite, manganese ore, sulphur and copper ore and also diamonds in Borneo. These mines are worked exclusively by private enterprises. Various springs in East Java produce iodine, which is mostly shipped to Europe in the form of copper iodide. In 1915 the production amounted to 50.5 tons (of 1.000 k.g.), in 1916 to 33 tons, in 1917 to 15.4 tons, in 1920 to 15.5 tons and in 1921 to 20.6 tons. Wolframite, manganese and sulphur are obtained in small quantities. The amounts of sulphur produced in 1911, 1912, 1913 and 1914 respectively, were 875, 305, 1236 and 300 tons (1.000 k.g.) while in the years 1915 up to and including 1922 only a very small amount was obtained. Marble quarries are found in Java, from which among other things the stone is worked into tiles. In 1922 the productions amounted to 500 M_3. There are also a number of lime kilns and factories of building materials. Near Padang a Portland cement factory has been working since 1911. This factory has been enlarged and its capacity is now 480.000 barrels a year.

The results of the diamond digging in the archipelago suffered under war conditions in the second part of 1914. The greatest number of diamonds is found in the district of Martapura in the south and east division of Borneo. The number of licences granted for diamond digging amounted in 1922 to 7.055.

Gold and silver production in the Dutch East Indies:

Year	Gold in k.g.	Value in glds.	Silver in k.g.	Value in glds.	Value of Diamond production in glds.
1919	2,874	4,736,352	31,316	2,891,406	129,600
1920	2,757	4,543,536	31,752	3,015,805	50,000
1921	2,920	4,812,160	31,787	1,893,870	180,554
1922	3,244	5,346,112	34,515	1,997,728	168,843

Petroleum

The development of the petroleum industry in the Dutch East Indies is comparatively new. The first concession was granted in 1883 in Langkat (North Sumatra) and has since been followed by several more. At the end of 1918 the number of concessions granted

and sanctioned by the Dutch East Indian government, amounted to respectively 61 and 26, of the latter 15 especially for petroleum and other bituminous substances.

The chief centres of production are located in the provinces : south and east division of Borneo, Palembang, Acheen, east Coast of Sumatra ; Rembang ; Sourabaya, Amboina (the island of Ceram). The products obtained from the crude oil are, among others : benzine, kerosene, residue or liquid fuel, lubricating oil, asphalt, and paraffin wax of which candles and batik wax are also manufactured. The oil from the various districts differs in appearance and composition, so that it can be worked into a large variety of products. The Sumatra oil, for instance, produces benzine, kerosene and lubricating oil, while the heavier Borneo oil yields kerosene, fuel oil and paraffin wax.

Benzine is put on the market in two grades : light and heavy, the one obtained from Sumatra is of the best quality. Great quantities are shipped to Europe. Kerosene or illuminating oil finds its chief market in Java, in British India, China, Japan, Australia and East Africa ; Alexandria is the most western market. Turpine serves as a substitute for turpentine. Diesel and Solar oil form intermediary products between kerosene and lubricating oil. Liquid fuel or petroleum residue is used as fuel in the refineries, while large quantities are shipped to different parts of the world. Batching oil finds a market in British India in the jute industry, where it is used to soften the fibres and to make them supple during the process of weaving. A modern plant for the distillation of engine oil is being constructed at Balikpapan, while two are working in Java and Sumatra. The refineries in Java and Borneo put a large quantity of the finest paraffin wax on the market. The one at Balikpapan is one of the largest and best equipped in the world. Part of the wax is used for the manufacture of candles which, on account of the high melting point of the Borneo paraffin wax, are particularly suitable for use in the tropics. The factory in Java caters for local consumption, the one at Balikpapan for export. Batik wax finds a market in Java in the domestic batik industry. Asphalt is sold partly on the local market and the remainder abroad. Tank steamers carry the products to all parts of the world. The greater part is shipped in bulk, but various ways of packing are adopted, for which purpose the tin factories supply the material.

The principal company, which controls almost the whole manufacture and output in the Dutch East Indies, though known under different names, is the " Royal Dutch Company for exploiting petroleum wells in the Netherlands Indies ". (Koninklijke Nederlandsche My. tot exploitatie van petroleum-bronnen in Ned-Indië), which was founded in 1890. This company gradually established connections with various other companies for the buying of the crude product, its shipping and distribution, with the aim of securing for itself a place in the world market. Beyond the Dutch East Indies also, it is steadily extending its sphere of activity for that purpose. The Royal Dutch Petroleum Company presents an example of a world-wide organization, which has made it possible to bring the petroleum industry in the Dutch East Indies to a high degree of perfection. In 1921 a law was passed by which the " Nederlandsch-Indische Aardolie Maatschappij " was registered to exploit oil-fields in Djambi. In this company the government participates for half of the capital and according to a sliding scale in the profits. The company started work in 1922, two exploration drilling plants having been erected so far. Here follow some figures regarding the production and exports :

Export of Petroleum Products in 1,000 L. (incl. Pulu Sambu)

Year	Production of Crude oil in D.E.I. in tons	Benzine and Gasoline	Kerosene	Residue	Turpine
1919	2,159,862	573,045	406,807	754,423	2,200
1920	2,365,320	489,721	352,923	268,417	6,564
1921	2,359,343	538,764	322,446	268,584	3,052
1922	2,381,924	637,696	243,380	371,021	2,497

Export (in tons of 1,000 k.g.) of (incl. Pulu Sambu)

Year	Paraffin Wax	Candles	Lubricating Oil	Asphalt	Greases
1919	22,797	5,626	27,056	2,647	208
1920	18,929	5,511	16,152	1,797	220
1921	22,408	4.001	11,326	1,181	364
1922	19,417	7,074	15,086	1,582	122

Narrow-gauge Mallet Locomotives for Burma

Five metre-gauge locomotives of the compound articulated type have been recently completed by William Beardmore & Co., Limited, at their Dalmuir Works, and sent to Burma. The service on which they will be engaged is an extremely severe one, both as regards gradients and curves. At Leybyin, for example, the line zigzags up a hillside with a steady gradient for 17 miles of 1 in 25 and curves of 337-ft. radius. At four places the train has to change direction, and the engine alternately pushes and pulls it up the hill. At Sedaw on the Northern Shan branch, a similar climb, 11 miles in length, has to be faced. These are possibly the worst parts of the many branches of the Burma railways, but gradients of 1 in 40 are quite common and the whole line is as difficult as it is picturesque.

The nature of the service explains the design of the engine. The driving wheels are 39-in. in diameter, while the high-pressure cylinders on the rear engine are 16-in. by 20-in., and the low-pressure cylinders on the leading engine are 24½-in. by 20-in. With a working pressure of 180-lb., the starting tractive effort is 30,000-lb. It will haul a train of 140 tons behind the tender up gradients of 1 in 25 at 10 miles an hour and trains of 220 tons up 1 in 40 at higher speeds. The boiler is of large capacity, having in all 1,180 square feet of evaporating surface and 224 square feet of superheater area. The grate has an area of 33 square feet. The steam distribution valves are of the piston type in the high-pressure and of the balanced slide type in the low-pressure cylinders. The lifting shackle fixed permanently to the first course of the boiler barrel is an interesting detail.

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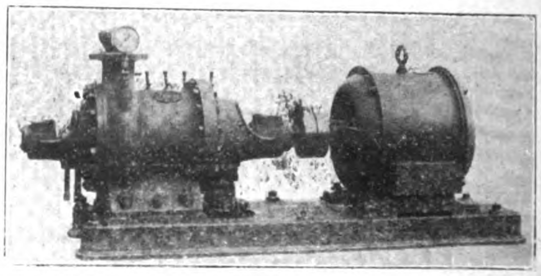
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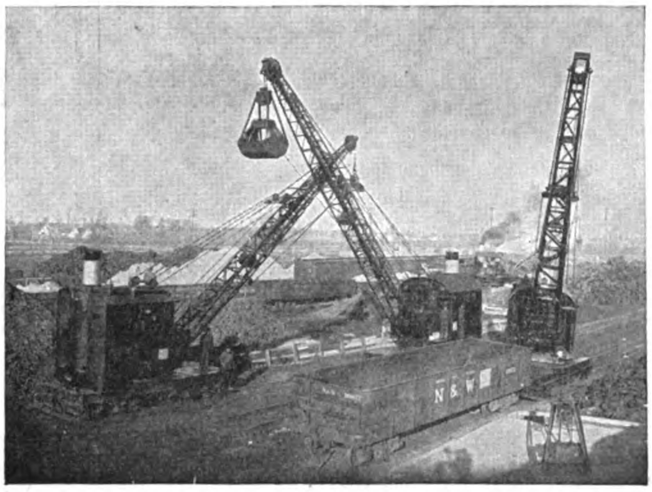
ELECTRIFICATION OF JAPANESE RAILWAYS

Vol. XX December, 1924 No. 12

SHANGHAI, PEKING, TOKYO AND MANILA

A. L. TAYLER



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VOL. XX SHANGHAI, DECEMBER, 1924 No. 12

SAITO

The Man Who Stood by Dewey at Manila

His Work in Korea

AN APPRECIATION

By Geo. Bronson Rea

WHEN Dewey shattered the Spanish fleet in Manila Bay in 1898 and issued his famous order subjecting all incoming vessels, including warships, to visit and special port regulations, von Diederich, the German admiral, resented this assumption of power and decided to disobey it. There was also a solitary Japanese cruiser, the "*Akitsushima,*" at anchor in the bay. Von Diederich's aide (von Hintze) called on its captain and urged him to ignore Dewey's regulation on the grounds that it constituted a violation of international law. The Japanese captain, however, refused to intervene replying that Dewey was right, that he would do the same if placed in the same position and he would accept the visit of the American naval officer as a welcome call of courtesy. That Japanese captain has since ascended the rungs of the naval ladder to the top, retiring from the service two years later with the rank of admiral and the title of baron. Entering politics as a liberal he forged to the front as one of Japan's ablest statesmen and administrators. Admiral Baron Makoto Saito is now governor-general of Korea, the most difficult post in Japan's civil service. He is still the same stanch friend and admirer of America and lover of fair-play as he was twenty-five years ago when he stood by his British colleague in an incident deliberately created to deprive America of the fruits of Dewey's victory. Had Saito accepted the German invitation, the history of the Far East since that date would have been written in another way. It is well to remember this almost forgotten incident at a time when American sympathies are being worked upon by propaganda calculated to deprive Japan of the fruits of her victory in the greater war which followed in 1904.

This incident may be accepted as convincing proof of Japan's declaration that she has no aggressive designs on the Philippines, for had she held such ambitions, then was the time to line up with Germany and dispute Dewey's right to play the rôle of conqueror. When, some years later, Roosevelt accepted Japan's assurances that she had no designs upon the Philippines and on the strength of this assurance entered into what for all practical purposes was a secret alliance with Japan for preserving the peace of the Far East, he acknowledged Japan's right to protect her national existence through the military occupation of Korea. The secret understanding between Roosevelt and Katsura might well be interpreted as a mutual recognition of the rights of their respective countries over these two dependencies, an unconstitutional method on the part of Roosevelt of arriving at a solution of Pacific problems that seventeen years later was endorsed at Washington through the four-power treaty. At that time it would have been impossible to put through a formal alliance, so Roosevelt in his own good way assured our position in the Philippines without reference to congress.

Admiral Baron Makoto Saito, Governor-General of Korea
The Man Who Stood by Dewey at Manila

Roosevelt stood firmly by Japan while he remained in office and to the time of his death was outspoken in condemnation of the anti-Japanese propaganda which flooded our newspapers and nearly led to war between the two countries. When asked to intervene between Japan and Korea, he said that America could not do for the Koreans what they were unable or unwilling to do for themselves. Korea passed under Japanese rule and was annexed as part of the empire. Notwithstanding our solemn assurances to concede independence to the Philippines as soon as they are fitted for self-government, the American flag still floats where Dewey planted it with a fifty-fifty chance that it will never be hauled down. The Philippines may yet be permanently annexed to the United States. Although such annexation would perpetuate our exclusion policy in an Asiatic territory, the Japanese have at no time challenged America's right to decide the future of the islands in her own way. America's position in the Philippines will never be menaced by Japan, a policy proclaimed to the world in 1898 for the first time by Captain Makoto Saito of the Imperial Japanese Navy and reiterated by Count Katsura, seven years later.

Although Roosevelt's recognition of Japan's right to protect her vital interests by annexing Korea, may have come prior to the understanding with Katsura and had no direct bearing on Japan's recognition of America's position in the Philippines, it will be difficult to dissociate one from the other. America's recognition of Japan's rights in Korea received its *quid pro quo* in Japan's recognition of America's position in the Philippines. The Roosevelt-Katsura agreement admits of no other interpretation.

For Japan, possession of Korea was a vital strategic necessity, the working out of the ages old law that the rights of a weak people disappear when they place in jeopardy the life of a stronger and better organized state. Japan entered Korea and made many mistakes, the natural outcome to a situation which compelled her to be ever on the alert against the moves of Russia in preparing for her war of revenge. Korea was then and will always remain, the strategic key to Japan's independence and with a vindictive enemy working against time to get into a position to renew the conflict terminated by the peace of Portsmouth, the administration of Korean affairs could not with safety be left to civilians. Most of Japan's troubles in Korea are traceable directly to the military *regimé* which subordinated other important measures to the strategical needs of the moment. This critical period ended with the great war and for the first time Japan could breathe easier and devote special attention to the application of much needed reforms in her new dependency. From the many excellent administrators that might have been selected for the post of governor-general, the choice of the cabinet and elder statesmen fell on Admiral Baron Saito, whose prominence in Japanese political life is better understood when it is recalled that had he wished, he might have been premier last year after the death of his colleague Viscount Admiral Kato. Much could be written about the splendid reforms placed in operation since he accepted the Korean post in September 1919 and devoted himself to the accomplishment of a task which will prove the crowning achievement of his life, and a monument to Japanese liberalism and tolerance.

Admiral Baron Saito is still an active force in the political life of his country with the possibility that he may be called upon at some future crisis to head the cabinet. The peace of the Far East, as far as Japanese aggression on the Philippines is concerned, is in no danger of being broken as long as statesmen of the calibre of Admiral Baron Saito exert an influence on the affairs of Nippon. The man who shaped the policy of his country in 1898 has the supreme satisfaction of knowing that his action was endorsed when Katsura and Roosevelt exchanged confidences in 1905, and has lived to see this informal agreement incorporated into the four-power alliance of 1922, in which America's position in the Philippines is assured against attack while Korea, the vulverable point in Japan's armor, is exposed to the menace of invasion. Swayed by a wave of anti-Japanese sentiment and driven forward by a group of hysterical Chinese propagandists, America demanded the cancellation of the Anglo-Japanese alliance, the only effective guarantee that Japan would never again be attacked through Korea. In order to demonstrate Japan's friendship for America, Baron Kato (Saito's naval colleague) cheerfully accepted the heavy responsibility of defending unaided the empire against an attack "from the direction of Urga." Peace in the Pacific was purchased at the expense of peace in Asia. While America enjoys the blessings and security that the new international agreement brings to the people of the Philippines and the Pacific coast, Japan, prostrated by a disaster that wrought greater havoc than any war, once more faces an uncertain future in Korea and Manchuria. All that she won during twenty years of diplomacy and unceasing vigilance in Asia has been taken from her. American naval strategists declare that the United States surrendered command of the Western Pacific to Japan at Washington, placing her in a position to attack Guam and the Philippines whenever in her opinion such action seems necessary, a one-sided argument advanced by big-navy advocates in order to increase the strength of the Pacific fleet. The fact that Japan surrendered her one guarantee against aggression from the other direction in exchanging an alliance with teeth in it for one that had passed through the hands of skilled American dentists is altogether lost sight of in the mad craze to keep her before the country as the hypothetical enemy. As a consequence, Japan now stands face to face with the grim realities of a situation that may at any time get beyond the control of diplomacy. Russia is again entrenched in Manchuria, exerting every pressure upon Japan to compel acquiescence to her demand for recognition. Mongolia is lost to China. Soviet influence at Peking for the moment is supreme. Through its control over the Chinese Eastern Railway, the Soviet has started a commercial war to undermine Japan's economic position in South Manchuria and Mongolia. The peace of the Far East hinges largely on Japan's right to develop these regions without interference. The clock has been turned back and we are now exactly where we were in 1914 at the outbreak of the great war. At Seoul, sits the man whose decision in 1898 marked the commencement of a policy on the part of his government which assured to America the peaceful enjoyment of the fruits of Dewey's victory ; is it too much to ask that American sympathy and support be now extended to Baron Saito in the tremendous efforts he is making to assure to Japan the peaceful enjoyment of the fruits of her victory in 1905 ?

The New Era in Korea

Baron Saito's administration marks a new era in the history of Korea through the abolition of the program of assimilation which characterized the rule of his predecessors and the inauguration of a new program based on the absolute equality of Koreans and Japanese as subjects of the empire. Administrative reforms were immediately adopted and placed in operation for implanting autonomy in local and provincial affairs and the way cleared for Koreans to have free access to the governor-general and lay their complaints directly before him. The ban on the publication of vernacular newspapers was raised, the unpopular wearing of uniforms and short swords was abolished and sweeping reforms made in the police system so that there are now 8,088 Koreans to 7,445 Japanese in the personnel of the force with about half the posts of superintendents, inspectors and assistant inspectors filled by natives. This radical departure from the old Japanese gendarme system makes practically impossible any repetition of the police outrages which followed the rising of 1919. Judicial reforms based on a new civil code drawn up with respect for Korean customs and traditions are now working smoothly. Whipping has been abolished and every effort is being made to secure the co-operation of Koreans in maintaining law and order by giving them equal supervision over the machinery of justice.

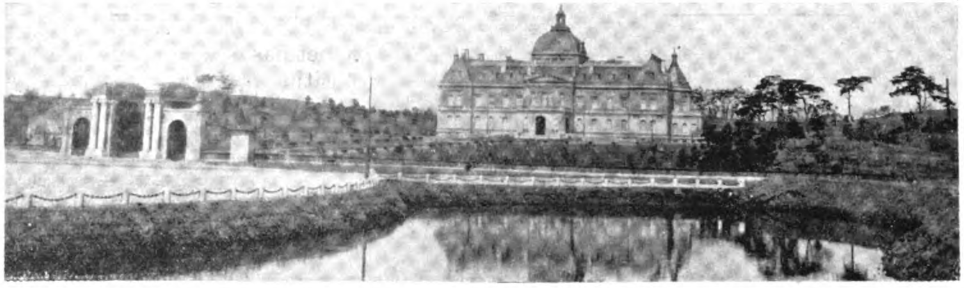
Provincial assemblies have been created, the members showing an earnest and conciliatory disposition to learn the rudiments of self-government, carrying on their discussions in an orderly and gentlemanly manner. Business has so far proceeded smoothly and the experiment seems to have been a success. What will happen in the future as the Koreans are given a larger share in their own government, remains to be seen. A fundamental educational system based on the methods employed in Japan has been drawn up and applied so that it can be fairly said that Baron Saito's cultural program stands on a par with that of any European colonizing power. In fact, one noted British writer has said that he would prefer to be a Korean under Japanese rule than a Hindu under Great Britain or a Zulu or Kaffir under the union government of South Africa. Korea now has six colleges, 25 technical schools and 55 elementary technical schools besides 870 primary and 21 high schools with an attendance of over 300,000. No less than 7,000,000 text-books are printed annually for the use of these schools.

The Economic Side

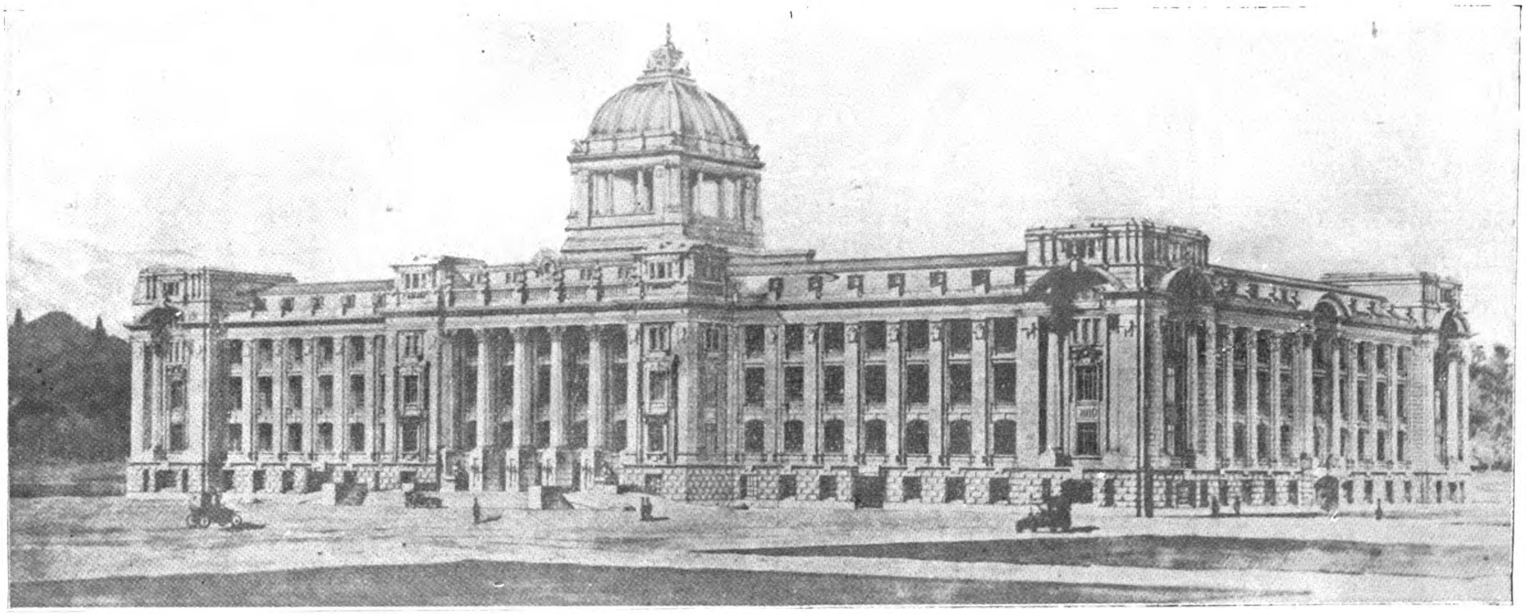
After laying a firm economic foundation, Japan is elevating the cultural status of the Korean in preparation for a larger share in his own government. But, as in the Philippines and China, so in Korea we find that modern education carried past a certain point makes for political discontent, creating an overwhelming desire for an official career as soon as school days are over. The Korean high school or college graduate sees little dignity in labor. He is adverse to agriculture or industry and although willing to go into banking or commerce, prefers the civil service where he invariably falls down in the examinations because of insufficient preparation and study. Disappointed in failing to obtain immediate employment, he complains loudly of discrimination.

The Korean holds a natural grievance against Japan for the loss of his nationality and seizes on anything that will keep alive national resentment. The older generation, recognizing the great difference between the present and the past regimes, are mostly contented with the change, but the youngsters fresh from college who have no background or knowledge of what native rule really

was in the past, are keen to have a laiger share in the management of their own affairs. The broader-minded Japanese realize that the only way to conciliate this element is to place the Korean on a plane of absolute equality and as they demonstrate ability and loyality to give them positions of tiust not only in the government of Korea but in other parts of the empire. These Japanese point to the fact that many of their best officials have come from the Loochoo Islands and believe the Korean student graduates would find a better opening in Japan proper and in Formosa than they will, in their own country, foi some time to come.



Official Residence of the Governor-General of Korea at Ryuzan

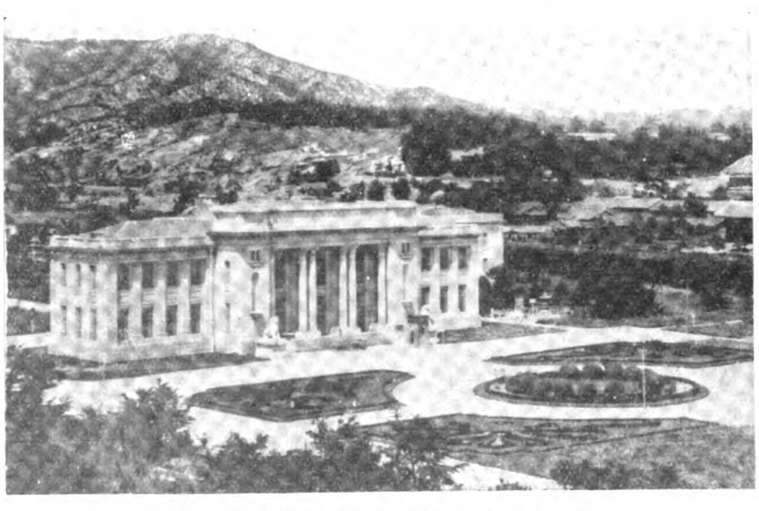


New Government-General Building at Seoul

It is the same old story of colonial government told in another way. The modern educated Korean believes he has arrived overnight to the point where he is able to govern himself and as time goes on, the Japanese will be compelled to concede this privilege more and more in order to consolidate Korea as an integral part of the empire. Realizing this, Baron Saito is doing everything possible to meet these legitimate aspirations, but no matter how far he may go towards this end, experience tells us that he will fall short of Korean expectations.

Offices of the Government-General at Seoul

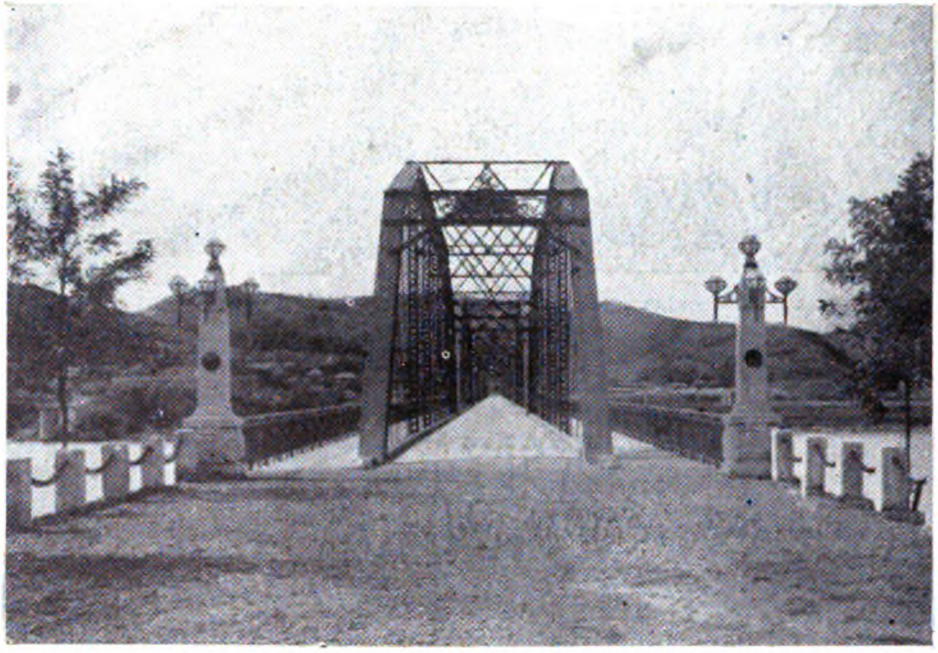
Thinking Japanese realize that many sacrifices must be made in order to transform Korea into a patriotic Japanese province, taking its place as the main defense of the empire against aggression from that direction. The fiiendship and allegiance of the Korean people is essential to the success of this plan and to gain their good-will and confidence is the fundamental plank in the new Japanese program for the administration of their country. The Japanese, wisely believe that the first step towards the attainment of this end is to better the material condition of the Korean by providing him with remunerative work and a market for his products. With this object always in view and under just laws and the resultant security for life and property, comparative prosperity has come to the Korean people. Good harvests, transportation facilities, river conservation, afforestration, industrialization, better living conditions, sanitary improvements and other benefits arising from good government have contributed in a large measure to the increase of the population from 13,313,017 in 1910 to 17,288,987 in 1920, or nearly thirty per cent. in ten years.



The New Government Museum at Seoul

Here we have an example of how a beneficent rule operates on the Asiatic birth rate. The Koreans are doubling their numbers in thirty years, twice as rapidly as the Japanese

and nearly six times as rapidly as the average white nation of Europe. Under these conditions, Korea offers no real solution to Japan's major population problem unless the Koreans are ousted from their lands to make room for the Japanese overflow. Like his Japanese and Chinese cousins, the Korean is rooted to the soil, opposed to emigrating except as a last resource. When he does make up his mind to seek a home elsewhere, he steps over the border into Manchuria and Siberia and looks to the Japanese government for protection. As a Korean, he is more or less welcomed by the Chinese and Russians, but as a Japanese subject carrying with him the principle of extraterritoriality, he becomes an object of persecution which materially adds to Japan's burdens in these territories. If the Korean continues to increase at the present rate he must in time slop over the border into Manchuria and the Russian maritime provinces. When this problem is added to Japan's ever present necessity of increasing her sources of food supply from within the empire in order to feed her own mounting millions, the task which confronts the Japanese authorities in Korea is not an enviable or an easy one. As time goes on it is inevitable that the Koreans will raise the cry that every Japanese who makes his home in their country is depriving a Korean of his patrimony, and every Korean forced over the border to seek his existence will harbor a grudge against Japan. It is easy to see that the solution of Japan's problems in so far as they pertain to Korea, will call for the most delicate handling, another reason why his government selected Baron Saito as the man best fitted to tackle a situation that had been man-handled by the militarists.



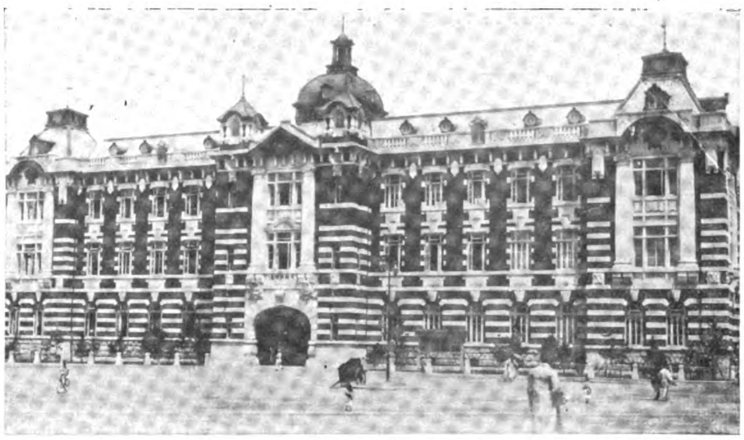
New Steel Highway Bridge over the Kan River

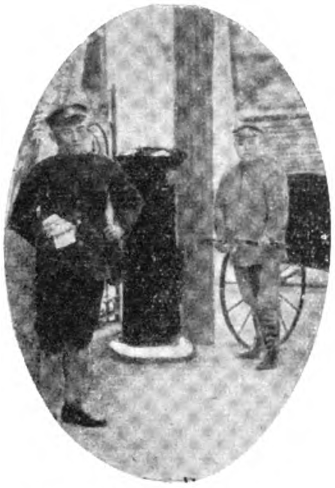
Typical New Road Construction, in North Chusei Province

Korea has always had an unfavorable balance of trade, its government being maintained in part by annual subsidies from Tokyo, while loans had to be raised for carrying out essential public improvements. Income from all sources from 1910 to 1921 exceeded Y. 1,090,000,000 but the sums paid out during this same period for importations reached Y. 1,440,000,000 an adverse balance of Y. 350,000,000. Faced with this condition, the administration of Baron Saito has concentrated on measures that will encourage the investment of new capital for the development of industries and the building of public works

The Old and the New: A Typical Old Korean Street in Heijo and the New Wide Avenue that now provides Transportation Facilities in the Same City

that will increase the wealth of the country. The result of this policy has wrought great changes in the industrial life of the peninsula and by the end of 1920 there were 2,088 industrial establishments capitalized at Y. 160,000,000 employing 55,200 hands, but as a result of the general readjustment which followed the boom period there were in existence at the end of last year 1,071 companies, not including banks, having a paid-up capital of Y. 154,000,000. The process of elimination and merging the smaller companies into the stronger combinations is still going on and there will probably be a further decrease next year in the number of industrial companies with a corresponding increase in capitalization, output and efficiency.



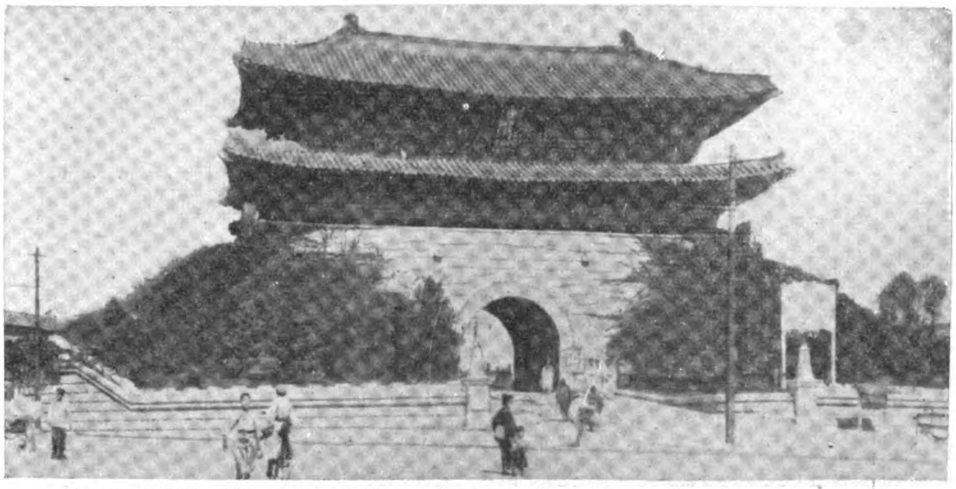


The Old and the New—A Korean Post Office Before Annexation (top); The Present Post Office at Keijo. Sides, Old Korean Postman and Present Types

This policy is already having a marked effect on the prosperity of the country, for with thriving industries and an unusually good market for staples, the exports from Korea for the first half of this year reached Y. 167,000,000 an increase of 25 per cent. over the same period of last year. For the first time in seven years the balance of trade was favorable, exports exceeding imports by Y. 6,200,000. In other words, Korea has turned the corner. Confidence in the future is being rapidly restored with a resultant stimulus to further efforts. A revival is noticeable in the mining industry which even as yet on a small scale, promises greater things. The future industrial centre of Korea will undoubtedly be located at the old town of Pingyang, now known as Heijo. Situated in the midst of a coal and iron district and with the possibilities of hydro-electric development in the Pingyang River, the dreamy old Korean city is fast being transformed into a modern industrial centre. A large beet sugar factory, the Mitsubishi Iron and Steel Works, coal mines, an extensive arsenal, many breweries and an electric power plant form the nucleus for this development. In a subsequent article we will deal more at length with some of the most important of these varied industries scattered throughout the country, of which over fifty are capitalized in excess of Y. 500,000.

Hand in hand with the encouragement of industries has gone afforestration, irrigation and the improvement of harbors and roads. Vast tracts have been reclaimed by irrigation and planted to rice and Korea is now exporting to Japan over 3,000,000 *koku* of this commodity annually, a very important addition to its food supply. Some of the larger irrigation works will be described in subsequent articles.

The general program for industrial development and the extension of public works, roads, harbor improvements, etc., has been considerably curtailed owing to the drastic financial retrenchment in all branches of the Japanese government and this year the expenses are being cut down some Y. 40,000,000 in order to meet the changed conditions. The Imperial Government, however, will extend a subsidy of Y. 15,000,000 for the Korean administration and the latter will be empowered to raise loans to the extent of Y. 10,000,000.



Contrasts: The Great South Gate, the Main Entrance to Seoul as it appeared Twenty Years Ago and To-day

The Roads of Korea

An Australian writer, who recently visited Korea, says that if one was dropped from an aeroplane into the middle of an old Korean town surrounded by the thatched roofs of houses that resemble giant mushrooms, he would find no street corners and be quickly lost trying to find a way out of the labyrinth. This condition, however well it may describe some of the smaller

towns is certainly not applicable to the larger centres where the construction of good roads and streets have gone hand in hand with the other improvements which characterize Japan's administration of the country. Under its native rulers, Korea hardly knew what a road looked like, all transportation being by coolie or horse along narrow, deep-rutted and meandering tracks which began nowhere and ended nowhere. It was not until 1906 that modern road construction was commenced, when the Japanese laid out the first four roads of a total length of 65 *li*. By 1910, 205 *li* were completed at a cost of Y. 3,900,000 and immediately after the annexation a definite construction program was drawn up in which all roads were classified under four heads.

Old Style Korean Provincial Government Yamen and Type of New Office Buildings

Appeal Court at Taikyu

Appeal Court at Heijo

District Court at Tyong-jyu

First-class roads, laid out with special reference to military as well as economic needs, came under the supervision of the government-general and were to be four *ken* in width with gradients not to exceed one in thirty. These roads connect the capital (Keijo) with the seats of prefectural governments, divisional and brigade headquarters, principal naval stations and the important ports and railway centres. The second-class roads also supervised by the government-general, are three *ken* in width with gradients not exceeding one in twenty-five. They radiate from the prefectural centres to the seats of district governments, ports and railway stations. The third-class roads, under the jurisdiction of prefectural authorities, average two *ken* in width and connect the prefectural and district centres with the smaller towns and villages in the same jurisdiction. Special roads include all those not in the above classification and come under the control of the particular city or district in which they are located.

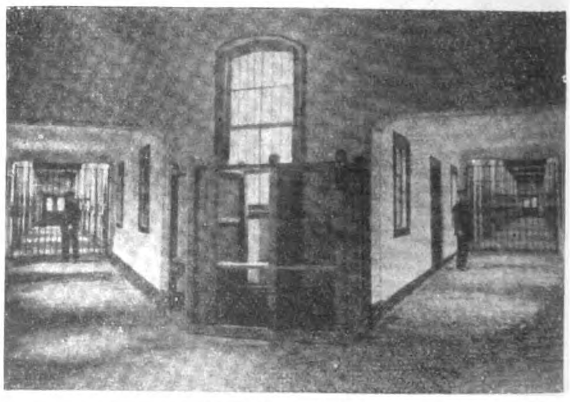
Modern Court House

Trial Scene under the Old Korean Judicial System

The first road program covering 34 first and second class roads, totalling 685 *li*, was laid down in 1910 and completed in 1917 at a cost of Y. 10,000,000. A second program extending from 1917 to 1922 was then entered into to construct 26 new roads, 478 *li* in length and nine bridges at a cost of Y. 7,500,000. Owing, however, to the rising costs of labor and materials during this period, only 258 *li* were built within the estimate, and to carry on, it was necessary to add another Y. 7,340,000 to the appropriation and modify the program to the extent that work on all unimportant roads was suspended and construction concentrated on new industrial and frontier roads and bridges urgently needed to facilitate the transport of products and defense against the border raids on Korean territory from Manchuria. For this purpose, an additional Y. 4,670,000 was set aside for frontier roads and 8,160,000 for bridges, making the total estimates for the second program, Y. 27,670,000.

Up to the end of 1923 the length of first class roads on the program totalled 794 *li*, second class, 2,394 *li* and third class, 2,849 *li*, a total of 3,188 *li* (first and second class) coming under the supervision of the

Old Style Korean Prison



New Style Prison

central government. Of this, 2,111 *li* or seventy per cent. of the program was completed. In addition to the road work, 52 bridges with a total length of 6,605 *ken* are provided for. The estimates for carrying out the full program are about Y.77,000,000. Bridge work will be exceptionally heavy owing to the fact that in the first construction program, most of the bridges were hastily erected of wood and are now in a state of disrepair and decay that necessitate heavy repairs or replacement by permanent structures. The life of these wooden bridges is placed at ten years and by the end of 1919, there were 3,276 such structures with a total length of 32,732 *ken* whose replacement would cost Y.15,200,000. With other new bridge construction this would call for an annual appropriation of over Y. 2,000,000 for this item alone. In order to cut down these expenses, new permanent bridges with concrete foundations and piles will be built where the traffic is heaviest and over the deeper rivers which cannot be readily forded in a wheeled conveyance. In the 1922 program the cost of these structures is placed at Y. 8,160,000, with another Y. 15,160,000 for maintenance of existing bridges.

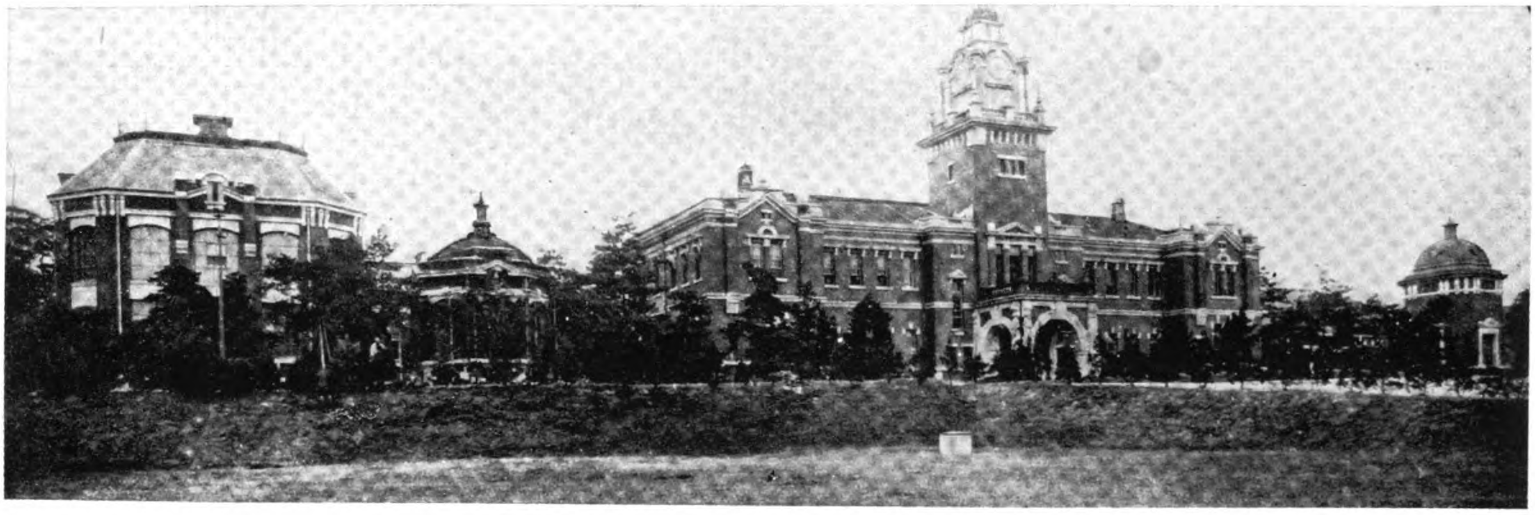
The total length of third class roads on the program is 2,849 *li* of which 1,820 are completed.

has been done for their improvement by straightening, grading, and widening existing streets, and constructing new ones.

Keijo, the capital of Chosen, being different in scale and plan from other towns, it was decided to undertake its street improvement at national expense. Forty-three of its streets were selected for improvement, of which 13 were completed at a cost of Y. 3,000,000 in the eight years from 1911 to 1918. The most important of these were made 12 to 15 *ken* in width and provided with pavements, and where the traffic is heaviest the macadamized surface is tarred, while the other roads were made not less than 8 *ken* in width, thus bringing about an extraordinary change in both the appearance and traffic efficiency of the city.

The second program now being carried out takes in nine streets, the budget estimate for which is Y. 3,400,000 spread over six years from the fiscal year 1919.

Other towns marked out for street improvement are Heijo, Taikyu, Shingishu, Fuzan, Chinnampo, Seishin, Moppo, and Genzan, towns in which provincial offices are situated, and certain others of some importance. The expenditure is defrayed out of the local revenues, sometimes assisted with a subsidy from the national treasury. A few of these towns have



In the main, these roads have been built by the local authorities assisted by government subsidies which up to the end of 1920 totalled Y. 2,300,000. At that time the local governments were provided with new sources of revenue and the subsidy was discontinued. In view, however, of the present financial stringency, the government will again be called upon to make further grants in aid of new local road construction.

The increase in the number of wheeled vehicles in Korea is seen in the following figures for the year ending December 31, 1923: Motor cars, 1,088: wagons, 32.161 ; ox-wagons 79,000 ; hand carts, 4,647 rickshaws and 92 carriages.

Medical Examination by Korean Doctor (top) and Modern Japanese Hospital Examination (bottom), Government-General Hospital at Keijo (centre)

already carried out the projected improvements.

Chosen is still far from being as developed as Japan proper, but the progress made in it being comparatively rapid, it was necessary to lay down a fundamental plan for street improvement, and make the various connected arrangements conform to it, so the government-general has incorporated in the budget an item for investigation regarding city improvement, in four large cities, viz., Keijo, Fuzan, Taikyu, and Heijo.

Street Improvement

Towns in Chosen for the most part contain narrow, dirty, and crooked streets, causing great inconvenience to communications and sanitary and fire-brigade arrangements. Much, however,

Sewerage

A proper sewerage system is a very necessary aid to sanitation, and it was decided to carry on this improvement side by side with street construction. On this work, the city of Heijo was pledged to spend Y. 580,000 in 11 years from the fiscal year 1913 to 1923, Keijo, Y. 1,600,000 between the fiscal years 1918 and 1924, and Taikyu, Y. 150,000 in 5 years from the fiscal year 1918 to 1922. Part of the money thus allocated is provided by the national treasury and part by public bodies.

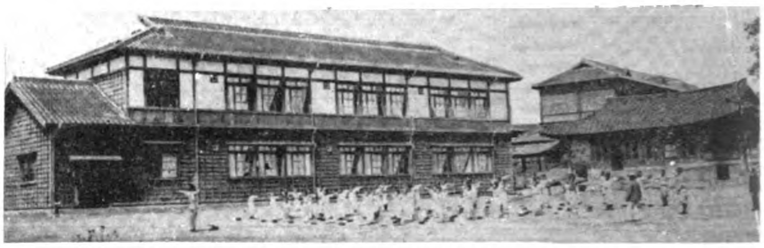
Modern Waterworks

As the first step towards better sanitary conditions in the peninsula, the Japanese authorities have steadily encouraged the establishment of waterworks. The drinking water throughout Korea

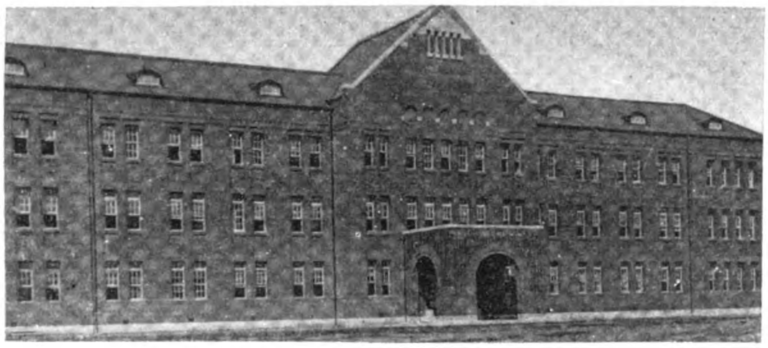
Keijo Girls' Higher Common School

Gensan Girls' High School

Business School for Koreans



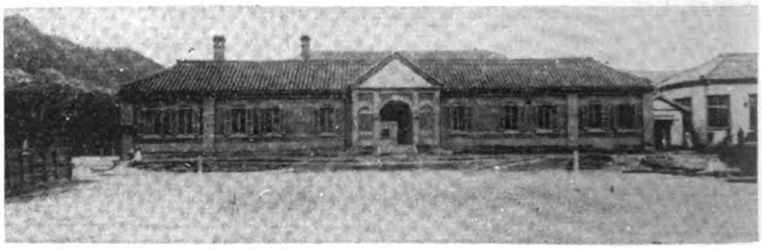
Common School for Koreans



Imperial University, Keijo, Preparatory Course

Keijo Higher Commercial School

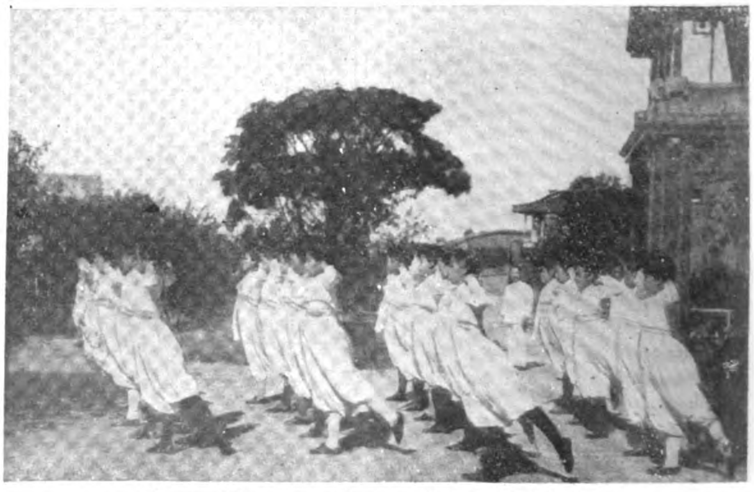
Japanese Middle School



High School for Koreans

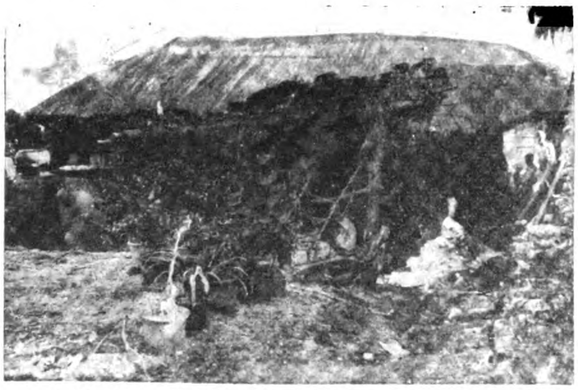
Heijo Middle School

Jinsen Elementary School



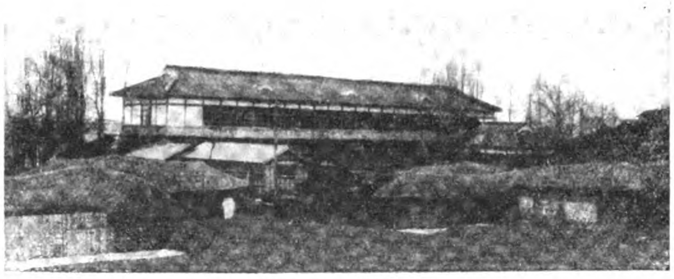
Physical Drill in Korean Girls' High School

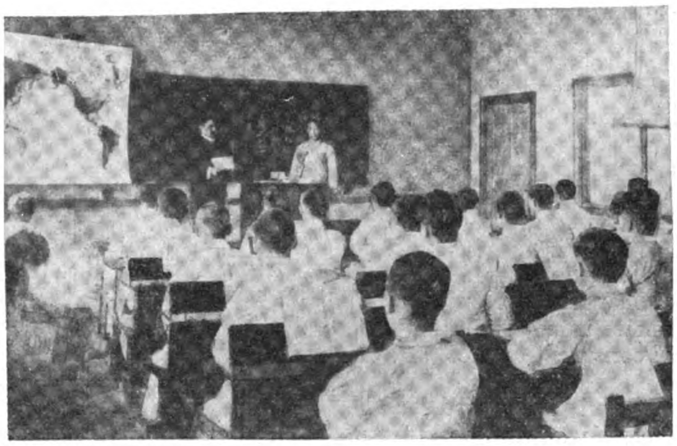
is in general very hard and filled with impurities, the wells being shallow and easily polluted. In 1915, special waterworks regulations were promulgated in which all new projects had to receive the sanction of the central authorities thus assuring the proper construction of reservoirs, distributing systems and the purity of the water.



A *Shado*, the Old Fashioned Korean School House that has been Replaced by Modern Educational Institutions

The first modern waterworks were installed before the annexation in Heijo and Jinsen with government funds. These were followed by similar plants at Moppo and Fusan and through its policy of encouragement there are now 26 municipalities operating their own water systems. It is a striking commentary on Japanese colonial government that in many matters it is able to carry out improvements that are difficult to implant in Japan proper. Only 128 cities and towns in Japan were equipped with waterworks by the end of 1921, some of these not even owning their own plant, purchasing their supply from near-by cities. There are still many prefectural cities in Japan without waterworks, yet in ten years practically every prefectural seat of government in Korea has been equipped with modern installations. This is explained in part by the fact that that the water in Japan flowing from the snow-clad mountain back-bone is relatively pure, while in Korea the quality of the water is correspondingly bad.

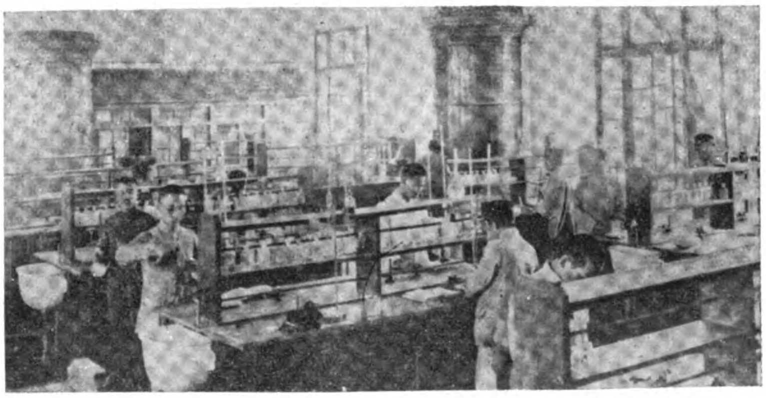




Exterior and Interior of Common School in Korea

Few of the cities or towns in Korea have been able to finance these improvements from their own resources, so the central government has provided at least fifty per cent. of the costs of installation from the treasury. These sums aggregate Y. 7,643,537 for the five principal plants at Keijo, Jinsen, Heijo, Chinnampo and Chinkai. In addition, the central government has disbursed about fifty per cent. of the costs of the waterworks for 21 other places aggregating Y. 3,443,699.

The government enforces a rigorous supervision over the quality of the water supplied in all cities and towns and is now urging the addition of an analytical laboratory for every plant. At present, the Keijo and Heijo plants are so equipped, the others relying on local hospitals and municipal health authorities to conduct their tests. The Keijo, Heijo and Jinsen waterworks were recently equipped with the chlorination system of sterilization and the government has ordered its installation in all the other plants in the peninsula.



The four waterworks (Keijo, Heijo, Jinsen and Chinnampo) built and operated by the central government were handed over to the municipal authorities in 1922 without compensation and at this date the ownership and operation of all waterworks in Korea are vested in the local authorities. Waterworks are now operating in *Keijo*, *Jinsen*, Gunsen, Moppo, Taikyu, Fusan, *Heijo*, Chinnampo, Shingishu, Gensan, *Seishin*, Koshu, Kaishu, Ranan, Seishu, Koshu, Kokei, Zenshu, Toei, *Shinshu*, Chinkai, *Gishu*, *Kanko*, Hoko, *Shunsen* and Kainei. The names in italics are equipped with pumping stations, all others being operated by gravity. For the present year (1924) waterworks construction has been started at Kinsen, Heiko and Joshin, while extensions are being made to the plants at Chinnampo, Fusan, Kainei, Taikyu and Koshu.

Keijo Technical College and Laboratory

The Power Resources of China

By T. Shing and W. H. Wong in "The China Express and Telegraph"

THE power resources of China are as yet imperfectly known, and as often happens in such cases, the general tendency is rather to exaggerate their importance. New research, however, has been made recently on the mineral fuels making possible a closer estimate of their resources than that generally known before. Some vague indications only can be given on the water-power resources. A general review such as the present one always shows the utter incompleteness of data and the pressing necessity of investigations on the natural resources of such a large country.

Mineral fuel is, and will be still for a long time to come, the principal power resource of China. Solid and liquid fuels will be treated separately.

Solid fuel includes anthracite, coal, lignite and peat.

Anthracite.—Anthracite occurs in many provinces in China. It is generally of carboniferous but in a few cases of Jurassic age. The best-known field occurs in North Honan in Hsiuwu and Tsingyang districts near the Loyang and Honan railway. The field contains an actual reserve of about 800 million tons of anthracite of the best quality. It is now worked by the Fuchung corporation, with an average annual output of about 1,200,000 tons.

This anthracite supplies, mostly for household purposes, the large cities of Hankow, Peking, Tientsin, and the country along the Peking-Hankow and the Loyang-Honan railways. Recently, however, an effort has been made by the Fuchung corporation to induce the Yangtze steamers to give its anthracite a trial: the result seems to be successful. It may be expected, therefore, that, with adaptation to steam-engine construction, the anthracite of which China certainly possesses an enormous reserve will contribute largely in the future to power generation in this country. Other large anthracite fields are found in the Shansi and Hunan provinces.

The actual resources of Shansi are estimated at 2,370 million tons and remain still almost undeveloped. The only important mine is that of the Pao-Ching Co., near the Shansi railway, producing 200,000 tons a year. The Hunan anthracite is exploited only by small native mines and supplies the local consumption and part of the Hankow market.

Coal.—Bituminous coal is now almost exclusively used for all power production in China, including electric generation, steam raising in all industrial works, railway locomotives and marine and river navigation, except for a few oil engines.

Its occurrence is widely distributed all over the country, and its reserve is, though not inexhaustible, quite considerable when compared with immediate demand.

Only coalfields near the railway lines or the large waterways are now being worked on a large scale, those situated in the interior are not touched except by the small native mines which cannot go down much under the ground water level, and whose output supplying the local demand is always insignificant in comparison with modern mining.

The only important coal mine to be mentioned from South China is the Pin-hsiang colliery in the westernmost part of Kiangsi, connected by branch line to the Hankow-Changsha railway, producing about 800,000 tons per year, which is almost totally consumed by the iron foundries of the Hanyehping company.

A coal which is almost lignite and also extensively worked is that of Fushun near Mukden, operated by the South Manchurian railway administration. It is rich in volatile matter (about 40 per cent.) and tertiary in age. The annual output amounts to nearly three million tons. This coal is used in steamers, locomotives and also in gas works.

Lignite.—Jolainor is the only important mine of lignite in China. It is near the Manchuli station of the Chinese Eastern railway, and its production of about 200,000 tons per year is hardly sufficient to supply the line.

Peat.—Peat occurs in several provinces, but no attempt has yet been made to use it for power generating.

Since the visit of von Richthofen, China's resources in mineral fuel have been reputed as fabulously rich. The estimates given in the "Coal Resources of the World" seem to confirm this opinion, especially Drake's figures, though those given by Inouye were distinctly lower. Recent estimates made by the geological survey of China are, however, much below what was expected, and as they seem to remain still the most reliable to-day.

Comparing the total with the reserves of the principal coal-producing countries given in the "Coal Resources of the World," we see that China's resources form only 79 per cent. of the reserve of Germany before the war, 33 per cent. of that of Great Britain, and less than 2 per cent. of that of the United States of America.

There seems to be no reason to be surprised by this conclusion when we realize that comparison is being made with the three most favored countries possessing the largest fuel resources of the world. The standard of workability is also much lower in China owing to various circumstances, chief among which is the difficulty of communication.

There are also natural factors for this relative smallness of fuel resource; the coal measures in China, though very extensively distributed, are generally less developed in thickness and the coal seams, though sometimes over 2 or 3 metres thick for one individual seam, are as a rule much reduced in number. The carboniferous coal measures in North China are generally less than 300 metres in total thickness and seldom contain more than five workable coal seams.

With a population roughly estimated at 400 millions, we have thus a little more than 100 tons of mineral fuel per head of population. If we suppose that the industrial development in China attains so high a degree that its consumption *per capita* is equal to that of Great Britain and the United States, *i.e.*, 6 tons per head, then our fuel reserve will only last a little more than 15 years. But if we take as the standard the present-day consumption, which is not much over 20 million tons per annum, then our resources will last more than 2,000 years. Of course, neither will be the actual case, and it is clear that China certainly possesses sufficient resources in mineral fuel for a long period of its future industrial development, especially so because these resources are widely distributed, and therefore will be able to supply power in almost every province.

Liquid Fuel

Petroleum is known to occur in several large fields in China, but it remains almost entirely undeveloped. There are three principal fields in Szechuan, Shensi and Sinkiang, which may be of future importance.

Szechuan Oil Field.—Oil occurs in a sandstone and shale formation, probably of Jurassic age, below the red sandstone which is so widely spread in that province. There are, within the great basin of Szechuan, so far as known, two anticlinal zones which are favorable to oil accumulation. One is the zone striking E.N.E.-W.S.W. from the north of Weiyuan and Hsiunghsien districts to a region situated on the Ming-kiang river, between the two districts Loshan (formerly Kiating) and Kienwei. It is in this latter region that oil is especially encountered by salt wells sunk through the red sandstone to a depth varying from 250 to more than 2,000 feet, and a second zone is parallel to the first but of much shorter extent. This elongated dome-shaped structure occurs in the Kungtsing and Tze-liu-tsing region, which is well known for its salt production. This region covers an area of 20 kilometres long in a E.N.E.-W.S.W. direction, and about 5 kilometres wide in a N.N.W.-S.S.E. direction. The salt wells, estimated at thousands, are especially centred along the axial line, and encounter several oil-bearing strata respectively at 1,700, 2,000 and 3,000 feet. The quantity of oil extracted is, however, scanty, and averaged, at the time of the visit by Louderback in 1914, at 250 catties per day, equivalent to no more than 50 tons in weight per year. No special effort has been made for investigating the oil from the native wells which are sunk only for brine. In the same formation which are sunk only for brine and which contains the oil, occurs the gas, which is sometimes, especially at the 3,500-feet level, quite abundant, and used for heating more than 6,000 brine evaporating pans.

Shensi.—North of Wei-Ho valley occurs a great basin of Mesozic sediments. The oil-bearing formation is called the Shensi series, and is probably of lower Jurassic age. It is a thick series of sandstone and shale extending from the Yellow River on the Shensi and Shensi border, dipping very gently westward at an angle of a few degrees. During 1914-1915 six borings from 2,000 to over 3,500-ft. in depth were sunk in the Yencheng, Tsung-pu and Yenan districts at the points where the structure seems to be the most favorable for oil accumulation. Several oil-bearing strata were encountered, but in relatively insignificant quantity, with the possible exception of the first boring in Tsung-pu district, in which more oil occurs at the level of 1,378 feet. Before these borings were undertaken by the Chinese government, with the co-operation of the Standard Oil company of America, four wells were sunk in Yenchang of the eastern border of the Shensi oil field by a government bureau. Two of these wells struck oil at 210 and 270 feet respectively, and each yields a daily output varying from 300 to over 400 catties. The oil thus produced is only used for local lighting purposes.

Sinkiang (or Chinese Turkestan).—The geology of Chinese Turkestan is yet very imperfectly known, but promising oil resources seem to exist over a wide area. Oil-bearing strata occur in the so-called Kansu oases between the Lungshan and the Nanshan ranges. Oil is extracted in small amounts for local lighting and heating purposes. In Sinkiang between the Altai and the Tientshan ranges, in several districts, such as Tihua (formerly Hurumtzi', Suilai, Usu and Tahcheng, quite a number of oil springs are known to exist, and attempts have been made to extract the oil by shallow wells. The best wells in Suilai and Tahcheng are said to have yielded more than 200 catties per day.

From the above outline it is clear that oil resources exist over wide areas in China. The fact that so far no particularly rich area has been known is due either to the absence of favorable structure necessary for the local concentration or simply to the lack of research. It may be hoped that the liquid fuel, when better utilized, will contribute one day its part to the power production of the country.

Water Power Resources

No waterfall of first magnitude comparable to the Victoria Falls in South Africa, and the Niagara Falls in North America is known in China. Falls of ordinary size are, however, not rare. Most of the large rivers abound, in their upper course, in rapids and waterfalls of which no accurate survey has yet been made. With the actual state of our knowledge, it is therefore impossible to form an exact idea of the water-power resources in China ; only a very general outline can be given here.

As a rule, water power is less abundant in North China than in South China because of smaller rainfall and smaller quantity of water in the north. River courses are, however, often cross cut by abrupt changes of altitude resulting the formation of rapids, these changes being due either to the normal fault displacement or to the outcrop of rock formations of notably unequal resistance. Thus, in the N.-S. course of the Yellow River between Shansi and Shensi provinces, there are several rapids, among which the best known is the Lung Men rapid. The whole volume of the Yellow River water is concentrated at that section in a narrow width of 50 metres, and flows down to the lower channel with enormous quantities of spray visible at a great distance. Such a waterfall would be an important source of power if properly developed. No other fall comparable to this one is found on the upper course of the Yellow River until Western Kansu is reached.

Besides the waterfalls, which are rather rare in North China, there is another kind of topographical feature which may be of importance for future power production. The rivers often wind their way sluggishly through the plains. When the bends are very sharp it would be easy to cut off the arc artificially, and have the river course thus shortened so as to produce a considerable waterfall. The case would be the same if instead of a closed loop of the river, the upper course of an open one were tapped by a tributary of the lower course. One illustration may be mentioned in Western Chihli, where the River Chumaho makes a big bend northward between Tzuching-kuan and Laishui district. A short artificial channel near Tzuchingkuan would be sufficient to have the Upper Chumaho captured by the River Yishui with a great fall of water.

In South China falls and rapids are rather common in the mountainous regions of the western provinces and on the north and south slopes of the Nan-ling range, though no quantitative data are available. Falls or rapids occur where the river cut across rocks of unequal resistance, such is the case with the upper course of many rivers in Yunnan and Szechuan. In Kuei-chow province, the prevailing feature is a high plateau composed of almost horizontal strata. Water often flows down from the top of the plateau to the deeply entrenched valleys ; cataracts are thus formed.

In North Manchuria, where the plateau is covered by volcanic lava flow, waterfalls also often occur—when the lava gives rise to abrupt change of height.

In conclusion, little is known definitely about China water-power resources. But it may be expected to be quite important so far as we can judge by a study of the topographical conditions. Such resources have never yet been utilizd for producing any mechanical work except in the crude water wheels which have existed for centuries, and yet almost everywhere it would be practicable to utilize power.

Electrical Development

The growth of electrical installations in China has been very rapid in the last few years. A recent review gives a total of 205,000 kw., including the 120,000 kw. of Shanghai. By far the largest part of the power is used for lighting, but in large cities such as Shanghai electrical power is also increasingly used for industrial and manufacturing purposes.

Coal is exclusively used for electric power generation. Nowhere has hydro-electric power been developed.

Hongkong's Water Supply

The Enormous Shing Mun Valley Waterworks Scheme

THE Hongkong public works department have devoted considerable study, for some years past, to the growing requirements of the colony as regards water supply. In general principle it was decided to adapt the Shing Mun valley on the mainland as a huge reservoir, and from thence to pipe line the water, via tunnels and lines under the harbor, to the island.

The first section of this great scheme has now been commenced by the placing of a contract, in open competition, with the civil engineering department of Sir W. G. Armstrong Whitworth & Co., Ltd., whose engineers are now established and working on this contract in Hongkong. The value of this contract for the first section represents some $1,100,000.

The work involved in the remaining portions of this projected public works scheme will amount to a value of over $18,000,000.

The contract which has now been placed with the Armstrong Whitworth Company, provides for all supervision, labor, materials, plant, tools, and equipment required for the execution of the following work :—

(*a*) The driving of a tunnel some 2,160-ft. long and 9 by 8-ft. section, for the purpose of carrying water through the " Smuggler's Ridge " hill.

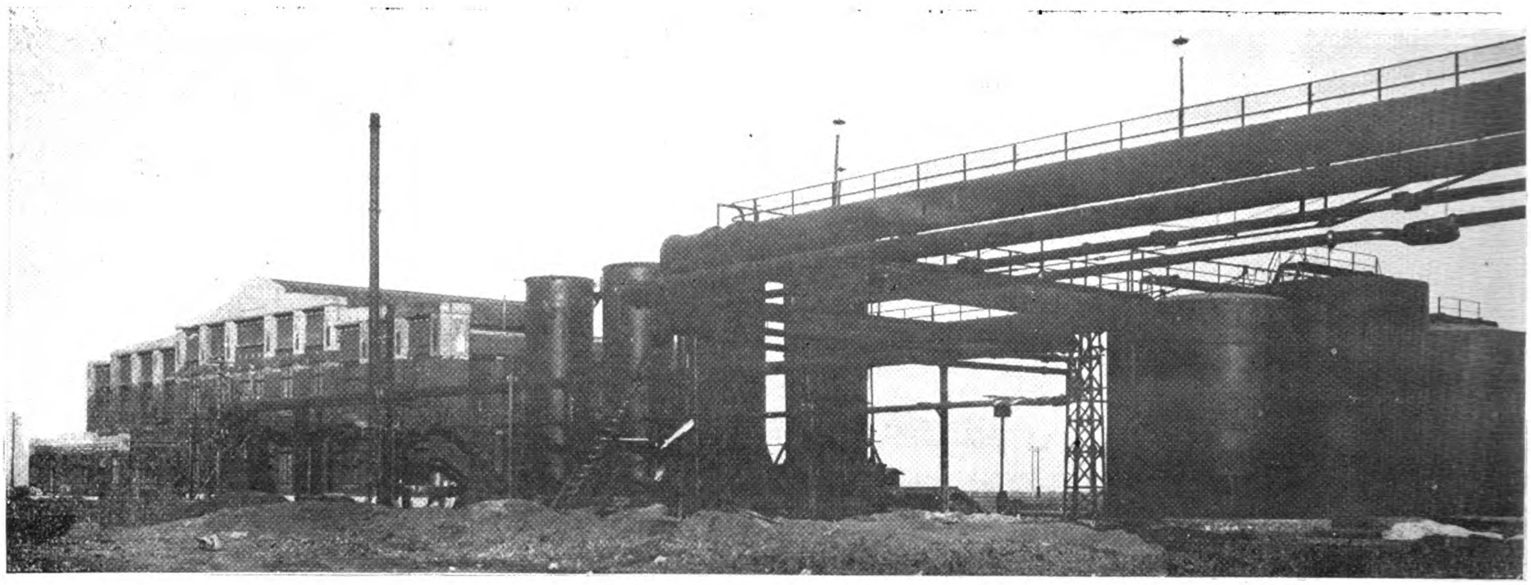
(*b*) The driving of a tunnel some 4,680-ft. long, and the same section, through the " Golden Hill."

(*c*) Excavations of loose and solid rock in opening out the mouths of the tunnels, and the necessary tunnel portals of granite ashlar.

(*d*) The construction of a concrete conduit, known as the " South Conduit " some 2,000-ft. long, connecting the above tunnels.

(*e*) The construction of a gauge basin and other works at the south end of the south tunnel.

It can be readily understood that when this great scheme is entirely completed, that the colony of Hongkong will have one of the finest water reserve and supply systems extant in the world.



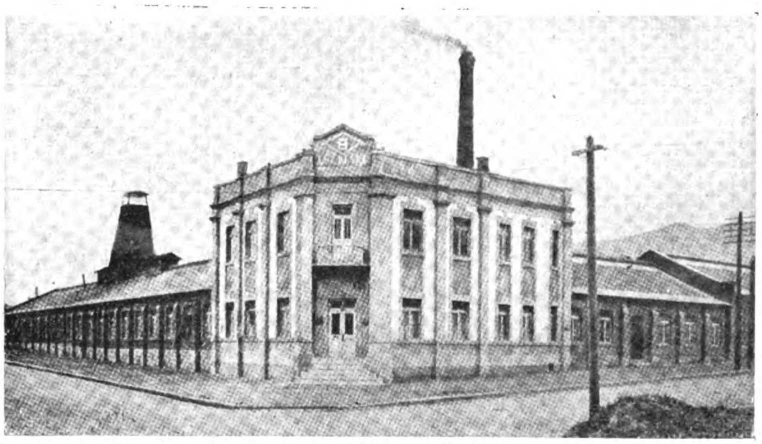
S.M.R. Sulphate of Ammonia Factory at Anshan, South Manchuria

Chemical Manufacture in Manchuria

THE South Manchurian Railway, organized in 1906, with an authorized capital of Y.200,000,000, since increased to Y.440,000,000 (£44,000,000), one-half of which is owned by the Japanese government, has in the few short years that have elapsed brought immense prosperity to the country. Development on the most modern and up-to-date lines has been the policy of the company, and it has one of the richest soils in the world on which to carry out its operations.

Progressive Policy of the South Manchurian Railway

One of the railway's first moves was to encourage the better class of Chinese and Japanese farmers to settle in Manchuria. They promulgated a scheme by which the land could be obtained on most advantageous terms, they established agricultural experiment stations at various points, as well as a central laboratory and a geological institution in the city of Dairen. At the experimental stations innumerable trials were made with a variety of cereals and trees. To the soya bean, of course, special attention was paid, with the result that the crops scientifically grown from specially selected seed, were far more prolific than ever before. The war, with its demand for enormous amounts of soya bean products, greatly assisted the industry, and the record prices received so encouraged and stimulated production that the latest available statistics show that no less than 33,585,000 acres are under cultivation in Manchuria and Eastern Mongolia, the figures of the latter country being 6,410,000 acres. In addition to that there is a further estimated area of 42,500,000 acres of magnificent arable land yet awaiting development. The land being reclaimed is calculated at about a million acres a year.

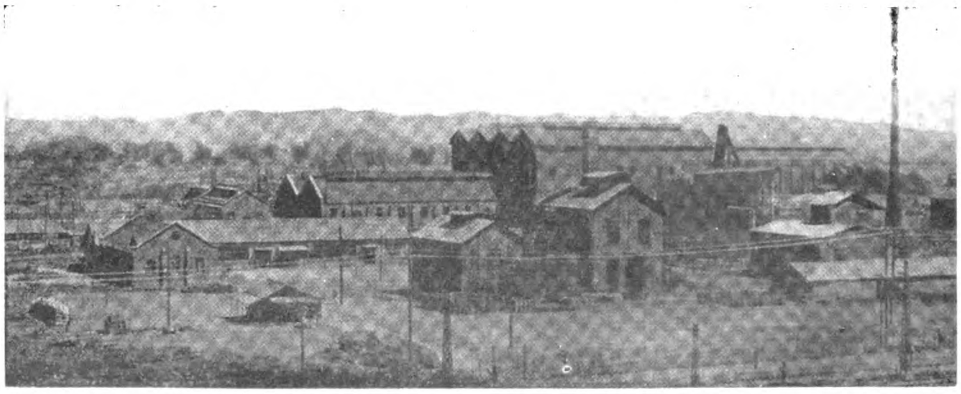


Inui Alkali Works, Dairen

Scientific Research Institutions

The central laboratory, originally established by the Kwantung government in 1908, was taken over by the railway two years later. The work was reorganized into eight divisions : analytical chemistry, applied chemistry, tussah spinning, dyeing and weaving, pottery, brewing, sanitation, electro-chemistry, and general. It was provided that for any enterprise promising to be commercially profitable an experimental factory might be set up, and that when any experimental factory reached the commercial production stage it should be turned over to a business company to operate. In this way a tussah silk spinning works was established in 1910, followed by earthenware and porcelain factories, and a fire brick kiln. Later a sorghum alcohol distillery, a dyeing and weaving works, a bean mill employing solvent extraction methods, and a fatty acid factory were organized. Still later there was added a glass factory and a lignoid factory.

The experimental soya bean mill, with its fatty-acid factory, was transferred to private management in 1915, upon the completion of the series of experiments for which

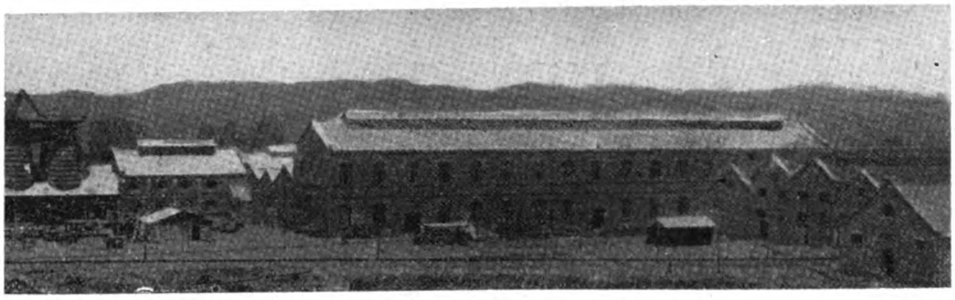


Coke Works and Sulphuric Acid Factory at Fushun

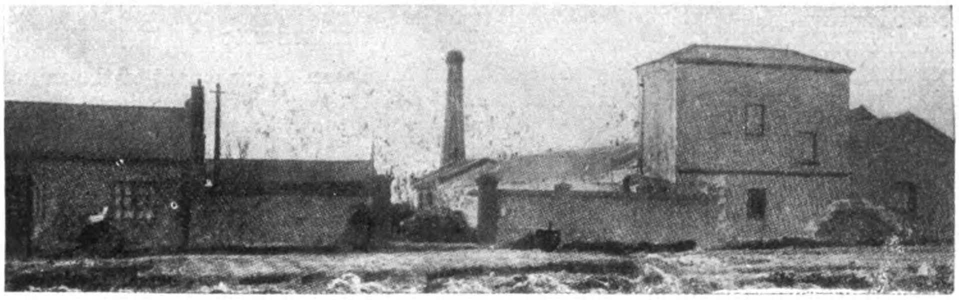
it had been established. Bean milling ranks foremost in Manchurian manufacturing industry, but only within the past few years, since the South Manchuria Railway inaugurated its campaign of industrial development, has the soya bean and its varied products become of importance in world trade.

Improved Soya-Bean Product Technology

Native oil mills are found everywhere in Manchuria—over 200—in all—and in these the cake is ground by mules or donkeys and the oil is expressed by hand labor. The Japanese introduced power presses, driven by steam, electric, gas and water power, and most of the modern mills are of this type.



Electro Chemical Company, Fushun



Mukden Chemical Works

A much more efficient solvent-extraction method has lately been developed through the railway's research department. Benzine is used, and not only is there no waste of oil, but the residue, in this case not in the form of cake but in bulk, is better fitted for fertiliser. By the expression system 133 pounds of beans give about 12½ pounds of oil and two pieces of bean cake each weighing 61 pounds. By the chemical extraction system the same amount of beans usually gives 17½ pounds of oil and 106 pounds of meal. In Dairen alone there are more than 60 mills producing 390 tons of oil and 3,700 tons of cake a day.

To facilitate the shipment and marketing of soya beans the company has organized a "mixed storage system." The beans are divided into four classes, according to colour—yellow, white eyebrow, green and black. The chemical composition according to analyses made in the Dairen central laboratory, is as follows (the figures show percentages) :—

	Moisture.	Albuminoids.	Oil	Carbohydrates.	Fibre.	Ash.
Yellow bean ..	9.11	39.90	17.59	24.27	4.92	4.21
White eyebrow	12.34	37.35	17.37	24.36	5.12	4.36
Green bean ..	12.64	36.47	16.23	25.08	4.89	4.69
Black bean	10.74	35.32	15.80	24.43	5.96	4.00

Fermentation Industries

The staple food of the Manchurian population is kaoliang, a variety of sorghum, which is also the principal food of the numerous animals engaged in farm work and the carrying trade. The annual production in Manchuria is about 180,000,000 bushels. Next to kaoliang, millet is the chief article of food. The distillation of alcoholic beverages for domestic consumption from the above cereals has always ranked as an important native industry. The liquors used by the Chinese are chiefly shumshu (sorghum alcohol), distilled from kaoliang, and huangchiu from millet. Both beverages are very similar to whisky. The output is worth about Y.13,000,000 (£1,300,000,) per annum.

The United States department of agriculture, in a recent report, made the following statement :—"The rapid rise of the soya bean to a crop of special importance in the world's commerce in the past few years is one of the most remarkable agricultural developments of recent times." The first shipment abroad was made in 1908 by the Japanese firm of Mitsui & Co. with 100 tons to London. With its very high percentage of protein (40 per cent.) the soya bean has been characterised as a "modern manna." Apart from the oil which goes largely to the United Kingdom, the United States and generally to the continent of Europe, the beans are exported mostly to China and Japan, and the bean cake to Japan.

Miscellaneous Chemical Products

Large quantities of starch are made from soya beans, kaoliang and potatoes. Hard oil, stearine, glycerine, and soap are produced from soya bean oil, and the Mukden Chemical Company is producing considerable quantities of gelatine and animal and vegetable oils. The cereal, kaoliang, as a result of the railway's research work, has become useful in many ways. Calcium lactate is an important by-product. Lactic acid is made from the calcium lactate and is used extensively in fermentation, dyeing, tanning, and other industries. The manufacture of paper from kaoliang pulp is another growing industry. From the ash of the stalks potassium salts are obtained for the manufacture of glass, medicines, fertilisers, and other products.

The "Salt Gardens" of Manchuria

Over the Yellow Sea and the Gulf of Pechili there is little rain and evaporation goes on actively. Therefore, the sea water is a more concentrated brine than usual, and salt manufacture is conducted very extensively along the sea coasts. At Yingkou, Kaiping, and Fuchou, the "salt gardens" under the management of the Chinese government and private individuals lie in an almost unbroken line. The sea water is forced into the "gardens" by means of the tide and windmills, and is left to evaporate in the sun. The salt industry is also conducted vigorously in the Kwantung leased territory. The yearly Manchurian output averages 150,000,000 bushels, of which about one-quarter is from Kwantung. Salt is a monopoly of the Chinese government. The government buys salt manufactured along the sea coast and sends it to different centres to sell at a specified price. The import of salt into Manchuria is forbidden. Salt produced in Manchuria is debarred from export, except to Mongolia and the Jehol district, but Kwantung salt is exported to Japan and Chosen.

Natural Soda and Other Minerals

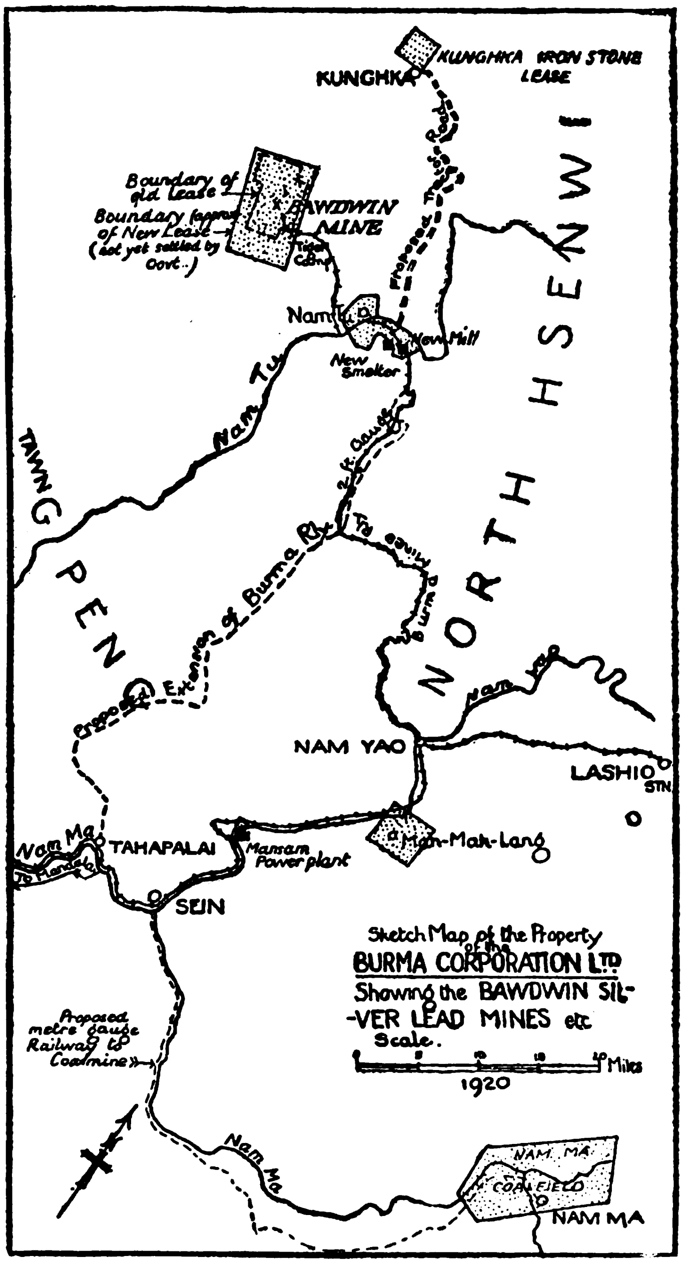
In Eastern Inner Mongolia there are large deposits of natural soda. The low plains, lakes, and swamps become white in the dry seasons (spring and autumn) and sometimes the soda forms in layers and presents a beautiful sight. Natural soda is worked at the native soda depôts. From spring to summer crude soda is compressed into brick from, and form autumn to winter crystallized soda of comparatively fine quality is obtained. Manchuria abounds with limestone which usually contains more or less magnesite. Near Tashihchaio a magnesite deposit of exceptional dimensions has been discovered. It has proved excellently suited to the making of fire-bricks and is now supplied to the government steelworks at Edamitsu, Japan, and to the Anshan steelworks. Talc, mica, fluorspar, sulphur, nitre, felspar, and silica are also found in considerable quantities throughout Manchuria, and the geological institute is using every means to encourage the development of these resources.

The Bawdwin Mine, Northern Shan States

THE only important deposit of silver-lead and zinc worked in India is the Bawdwin mine, in the Northern Shan State of Upper Burma. The extent of the deposit has already been alluded to a previous article and it will suffice to say that development has proved it to be one of the greatest leadzinc orebodies in the world, to say nothing of possibly very important copper potentialities.

The ore channel, cutting across a formation of rhyolitic tuffs of pre-Cambrian age, is an extremely faulted zone, fully 8,000-ft. in length and with a width of 400 to 500-ft. Within this zone three important orebodies are known, only two of which are at present opened up—namely, the western or Burma orebody, containing a thin vein of silver-lead ore, and a large replacement deposit known a the Chinaman lode, extending for a length of at least 1,200-ft. and varying in width from a few feet to over 100-ft.

The central orebody, known as the central or Shan lode, lies parallel with the Burma, and carries copper as well as silver-lead and zinc ore. Geological examination suggests that orebodies may be reasonably expected to extend throughout the whole length of 8,000-ft., and as far to the south as the rhyolitic tuffs extend. Indications are not wanting that exploration in a northerly direction may possibly expose large deposits of copper ore.



Early Smelting Operations

The attention of Europeans was first attracted to the Bawdwin mines by huge piles of rich lead slag, low in zinc, from which the Chinese had removed the silver, in some cases, perhaps, centuries ago. A smelter was erected at Mandalay in 1908, and a narrow-gauge railway constructed from the mine to the Lashio-Mandalay branch of the Burma Railway to convey the slag to the smelter. During 1911 the smelter was moved to Namtu, and subsequently, as the slag left by the Chinese began to be exhausted, the plant commenced operations on the ore itself, which was discovered by exploration of the old Chinese workings.

This ore consisted entirely of sulphides, which necessitated roasting before it could be successfully smelted, and output was limited at first by the capacity of the roasting plant. Roasting was originally effected in six Godfrey furnaces, each capable of treating 40 tons in 24 hours and reducing the sulphur contents of the ore to 10 or 11 per cent. These furnaces were used as preliminary roasters, the partly de-sulphurised ore being subsequently sintered in Huntingdon-Heberlein pots, and the sulphur content was further lowered to about 4 or 5 per cent. Additions to the roasting plant have been made from time to time, and during 1918-20 a concentrating mill was erected at Namtu with a nominal capacity of 1,500 tons of ore per day.

Mining Developments

The early history of the European development of the mine is one of a continued struggle against many difficulties. The old workings left by the Chinese were in a deplorable condition, many being caved-in and filled with water.

One of the drives just missed the Chinaman lode, and the second was driven straight through a big fault between the Chinaman and the Shan lodes. After two years of strenuous and discouraging work the main orebody was struck by what is now known as Dead Chinaman's Tunnel (No. 2 level). From that time onwards development was rapid, and to-day the Chinaman orebody is considered to be one of the largest high-grade silver-lead-zinc orebodies in the world. The ore reserves are quoted below, but it may be stated here that in addition there are probably another million tons or more of lower grade ore (8—20 per cent. combined Pb and Zn), of which account has been taken.

The ore occurs as solid masses of sulphide without admixture of gangue. On some levels the orebody averages 50-ft. in width for a continuous distance of 1,000, and in a few places is 100 to 140-ft. wide, and may carry upwards of 75 per cent. zinc and lead sulphide.

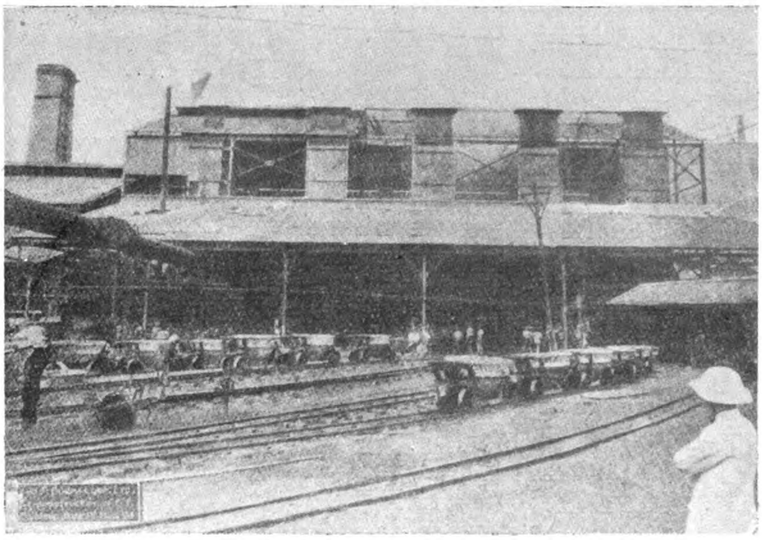
The mine has been systematically developed down to the 653-ft. (No. 6) level or main adit known as Tiger Tunnel, which is about two miles long. This tunnel is 7,369-ft. long to the internal shaft, with a volume capacity of 662,850 cub. ft. It was started in April 1914, and completed in September 1916. There are two sets of rails, and the trolleys that haul the truck-loads of ore are worked by electric current conveyed by overhead wires. Very little hand work is employed in the mine. Six levels are already being worked, and a seventh is in process of development. The ore is blocked out by a series of crosscuts, from which rises have been put up every 100-ft. All the ore from the various levels is dropped to the 6th level, where it is loaded into 4-ton trucks and conveyed to Tiger Camp.

The seventh level is showing extremely satisfactory results, four crosscuts disclosing ore widening out from 14½-ft. to 77-ft. from the first to the fourth cut. Both lead and silver contents are above the average of the reserves, and a very favorable feature is the large diminution in zinc content, an important factor in the subsequent treatment of the ore. This

decline in the ratio of zinc to lead has been noticeable from the fourth level downwards.

Rapid progress is being made with the main circular shaft; the old vertical shaft is being stripped to No. 6 level to a circular section, 14-ft. internal diameter, with masonry lining. It will be divided into three main compartments—two for skips and one for a large cage, with two smaller compartments for counter-weight, pipes, cables, and manway.

At Waller Gorge, Tiger Camp, huge ore bins have been erected, into which the ore is fed by a 29-in. belt conveyor. The ore is subsequently taken by trains to the Namtu smelting plant.



Smelting Plant Blast Furnaces

Hydro-Electric Plant

The electric power supplied to the plant and mine is entirely derived from the Mansam Falls. The Falls them selves constitute one of Nature's beauty spots, and are fed by the Nam Yao River, which plunges in a series of giant steps down to the Burma corporation's power house situated at the bottom of the valley. Electricity is transmitted at 33,000 volts to Namtu and Bawdwin. The transmission line is supported on 250 steel towers on the Mansam Falls, Namtu section, a distance of 26 miles, and from Namtu to Bawdwin (12 miles) there are over 70 towers. A new sub-station has recently been completed at Namtu, and three new 700 k.v.a. transformers put into commission. The old transformers have been re-erected at the smelter sub-station, and are fed direct from the 33,000-volt mains.

During the past year over 20 million units have been generated at the Mansam hydro-electric plant, which not only supplies the mine, milling, and smelter equipment, but is also employed for lighting the company's settlement at Namtu.

Water Supply for Dressing Plant

The operations carried on at the mill call for a large supply of water, which is obtained either from pumps at the Namtu river, half a mile away, or from a flume which taps the Namla river on the other side of the Namtu valley. Near the mill site there is a large concrete-lined reservoir with a capacity of about 3,000,000 gallons, in which the water used is stored.

Present Smelting Plant

The smelter has been recently remodelled, and the main units of the smelter plant now comprise the following :—

Five Godfrey roasters, used for the preliminary calcination of the ore.

Four primary Dwight-Lloyd sintering machines.

Three secondary Dwight-Lloyd sintering machines.

Twenty-nine Huntingdon-Heberlein pots.

Five blast furnaces, with the accessory blowing plant.

Refinery and silver room plant, having a maximum capacity of about 4,000 tons of refined lead and approximately 500,000 ozs. of silver per month.

A new smelter flue has been added to the plant within the last eighteen months—the occasion of an opening ceremony by H.E. the governor of Burma—and has effected the greatest improvement to living conditions in Namtu, the smoke and fume being carried clear of the settlement, to the benefit of all classes of inhabitants.

The concentrates sent to the sintering plant run about 40 per cent. lead, with 37 ozs. of silver per ton, 22 per cent. of zinc, and slightly over .5 per cent. copper, with a similar amount of nickel.

About 25 per cent. of iron ore (derived from the Wetwun district and Namphat) is added, and the mixture roasted in the Godfrey furnaces. It is subsequently sintered in the Dwight-Lloyd plant or Huntingdon-Heberlein pots.

The use of the Dwight-Lloyd sintering machines is invaluable, not only in increasing the tonnage of ore put through the blast furnaces, but also in lowering the sulphur content and consequently improving the running of a high zinc charge.

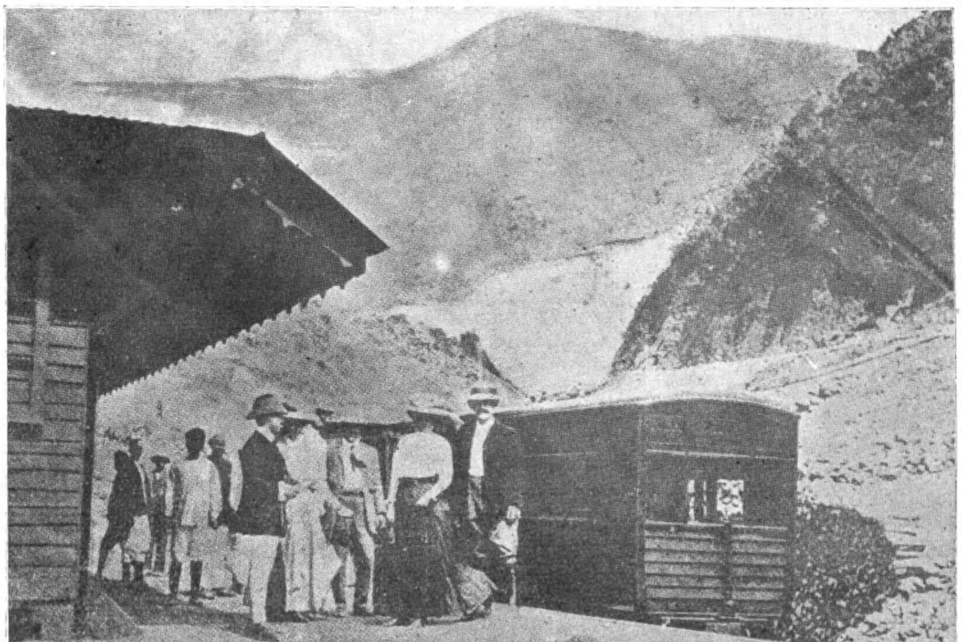
The blast-furnace slags previous to 1918 had carried about 15 or 16 per cent. zinc oxide ; a small amount of matte was produced, and occasionally speiss containing 25 to 30 per cent. nickel. An effort was subsequently made to run a slag with a higher zinc content, and the slags at present produced carry no less than 25 to 26 per cent. ZnO.

The limestone required for such a slag is much less than had previously been the case, and against the increased percentage of FeO in the slag must be placed the lessened quantity of slag actually produced.

During 1922 over 200,000 tons of charge were smelted, including refinery drosses nd settler slags, having an average assay value of 28.6 per cent. lead, 14.3 per cent. zinc, and nearly 27 ozs. silver ; 42,000 tons of hard lead were obtained from the smelting of the ore, over 7,000 tons from refinery drosses, and nearly 700 tons from settler slags —a total of 50,374 tons. The lead averaged 103 ozs. of silver per ton.

During this period over 1,000 tons of copper matte and 1,000 tons of nickel speiss were produced in the furnaces, which is stacked for futuer treatment.

Nearly 25,000 tons of coke were used in the blast furnaces, equivalent to 12.36 per cent. of the charge. The amount of slag and the analysis of same will be of interest to our metallurgical readers. The figures are as follows : Slag produced, 94,060 tons. Analysis (approx.)—SiO_2, 23.06 per cent. ; CaO, 5.85



Terminal of Railway to the Bawdwin Mines

per cent.; FeO, 30.81 per cent.; ZnO, 25.83 per cent.; Pb, 3.65 per cent.; Al_2O_3. Mgo, etc., 10.80. Silver, 1.07 ozs. per ton.

Refinery

The capacity of the refinery has been enlarged to cope with the increased output from the blast furnaces, and the disposition of the units so arranged that further extensions can be made as required without interruption to current operations. Many minor improvements have been effected, and the refinery may now be considered a very satisfactory and compact unit.

Oil fuel has been used with highly successful results in the refinery, and has now entirely displaced the wood fuel formerly used, supplies of which were running low and the cost high. Chinese workmen quickly became accustomed to the use of oil, and regulated the heat better than was possible when using the very variable wood fuel cut by the coolies.

51,869 tons of hard lead from the blast furnaces were treated, giving a yield of 39,214 tons of refined lead, and no less than 4,205,-584 ozs. of refined silver were obtained during the period under review.

It is of some interest to compare the figures obtained during 1922 with those of 1923—taken over two periods of six months each :—

	Jan.-June 1923.	June-Dec. 1923.
Hard lead produced ..	27,842 tons	12,417 tons
Refined lead obtained ..	21,654 tons	11,598 tons
Refined silver obtained	2,274,441 ozs.	1,296,152 ozs.

The analysis of the slag remains singularly constant, SiO_2 contents averaging 23.33 per cent., CaO 6.29 per cent., FeO 31.22 per cent.; ZnO is slightly higher at 26.54 per cent., and the silver content is identical at 1.07 ozs.

Ore Reserves

The following table shows the estimated ore reserves and the assay value of same for 1921-1923 :—

	Tons	Lead. Per cent.	Zinc. Per cent.	Silver. Ozs.
December 31, 1921 ...	4,290,358	25.1	17.5	23.9
December 31, 1922 ...	4,555,069	25.4	17.1	22.9
July 1, 1923	4,511,999	25.3	16.9	22.8

Mining Settlement and Improvements

The Burma Corporaton's mining settlement at Namtu has a population of approximaterly 20,000 people, of whom about 150 are Europeans and Australians. The town, together with the smelter where the ore is treated, lies in a large hollow in the midst of one of the many clusters of hills on the western boder of Hsenwi state. The European residential quarters extend from the southern side of the hollow and over the hill, on the crest of which stands the general manager's bungalow. A bird's-eye view of Namtu is obtained from the hill on which the European members of the staff reside. Chinese laborers' quarters extend from the bottom of the hollow and over to the right, while on the left is the smelter. Behind the smelter, and clinging to the face of the steep hill which forms the further side of the hollow, is the new flue. This new flue is intended not only to take away from the immediate surroundings of the workers the destructive sulphur and lead fumes accruing from the smelting process, but also to recover an appreciable percentage of the lead which is at present being carried away and deposited on the adjoining countryside.

It is not many years ago since Namtu was a part of the country a visit to which would not have been anticipated with feelings of joy. It was fever stricken, dangerous to travel and work in and forbidding in many ways. But such obstacles to the development of industry in a country had been overcome elsewhere, and it was not with feelings of despair that the staff of the company then conducting operations set to work to rid the countryside of its perils, natural and otherwise. Now, as medical statistics show, it is a health-giving place, and is as free from malarial fever and other diseases as is Rangoon.

The Burma Corporation has much to be proud of, and has done much for the development of the mining and allied industries in Burma. We can emphatically reiterate Sir Harcourt Butler's sentiments with regard to this company by quoting his own words: " The great need of Burma, as of India, is to attract capital for its development. I am one of those who hope and believe that in increasing measure Burman and Indian capital will come forward to follow in your pioneering footsteps. If once the industrial science of the west and the resources of the east really join hands, there should be little limit to progress in this land so rich, so favored by Nature."—*Mining Journal.*

New Twin-Screw Shallow Draft Yangtze River Steamer

THE Hongkong and Whampoa Dock Company, Limited are building at their works at Kowloon a new twin-screw shallow draft river steamer for the Hankow-Ichang service of the Indo-China Steam Navigation Company, Limited. This vessel will have the following dimensions :—

Length overall	285′ 0″	
Length between perpendiculars ..	275′ 0″	
Breadth moulded	46′ 0″	
Depth moulded	11′ 0″	to main deck

The vessel has two complete decks, with bridge deck amidships and boat deck aft, and is divided into six W. T. compartments by five transverse bulkheads, and has a deadweight carrying capacity of 1,330 tons on a draft of 9-ft. 0-in.

Cargo is carried in the fore and aft holds and also in the 'tween decks. The latter will also be required for deck passengers. The facilities for working cargo consist of twin masts forward and derrick posts aft, the forward derricks being capable of lifting loads up to 10 tons. Two winches are provided for each hatch, also two small wall winches.

The rudder is controlled from the bridge by the McTaggart Scott system of Telemotor gear, which is led to Hastie's steam steering gear, directly coupled to the rudder head.

A powerful steam windlass is fitted for working anchors and cables, a warping capstan being fitted aft.

The ship will have accommodation amidships for twelve 1st class passengers in six commodious staterooms, each having two cot beds, and a continuous supply of hot and cold fresh water. The usual electric fans and radiators will be provided. The dining saloon situated just forward of the cabins, will have seating accommodation for twenty, and will be handsomely fitted out in teak, set off with carved and polished hardwood pilasters. A smoke room will be constructed at the after end of the bridge deck.

Accommodation for 2nd class passengers will be provided on the aft boat deck, where there are nine 4-berth cabins and a large dining saloon.

The captain's quarters, consisting of bedroom, sitting room and bathroom, will be situated just abaft the navigating bridge, the officers and engineers being housed amidships on the upper deck.

The vessel will be electrically lighted throughout and fans and electric radiators will be provided in all public, passenger and officers' rooms.

The vessel will be propelled by two sets of triple-expansion engines, having cylinders $13\frac{1}{4}''$—22″—35″ with a stroke of 18-in. Steam is supplied by two Thornycroft watertube boilers, designed for a working pressure of 250-lbs. per sq. in. The boilers are arranged for coal fuel only, with the Howden's system of forced draught.

The engine room will be equipped with auxiliary machinery of the most modern pattern, consisting of one Uniflux type condenser with steel body, monotype air pump, 2 independent main feed pumps and heater, evaporator, centrifugal circulating pump, independent bilge, sanitary, fresh water and ballast pump. The reversing engine will be of Brown's latest make, and the thrust block of the Michell type and a Crompton's ash hoist will be fitted.

Electrification of the Imperial Government Railways of Japan

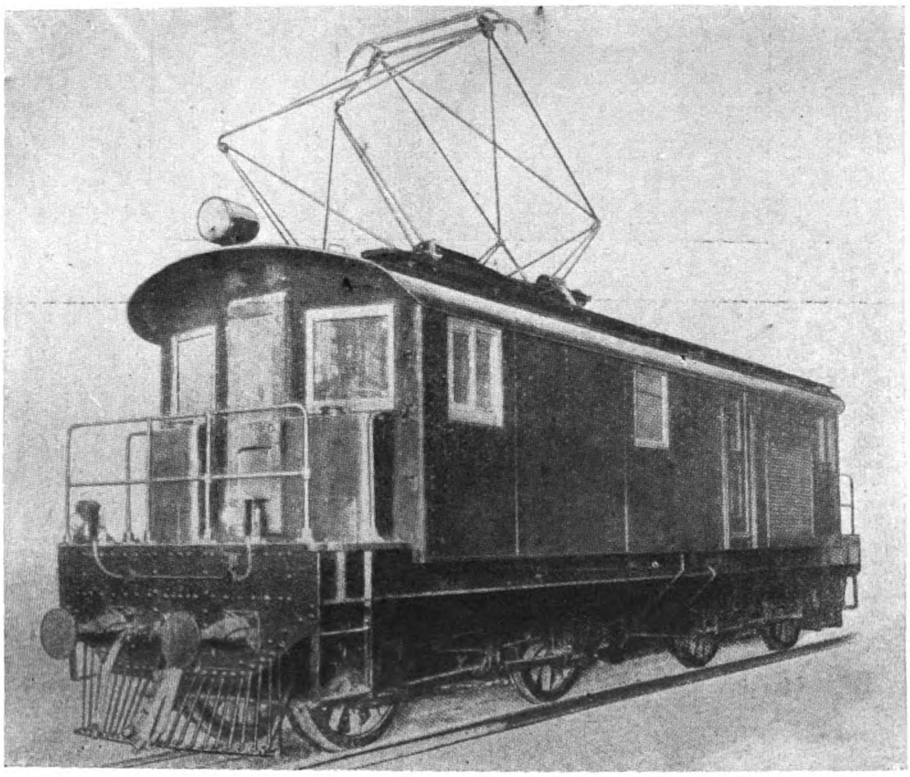
H. C. Hickock*

THAT the Imperial Government of Japan has definitely decided upon on a general program of electrification for its trunk lines is a fact of considerable significance. The government railways comprise some 9,000 miles of track and include more than eighty per cent. of all the railway trackage on the main islands of the empire. Exclusive of colonies, there are in Japan approximately thirteen route miles of railway for every 100,000 inhabitants and a little more than five miles of railway to every 100 square miles of area. This mileage has been accomplished within a period of about fifty-three years.

The traffic on the empire has grown enormously, requiring the operation of a number of light trains running with short headway, and it would be difficult to meet the demand for additional service with present facilities because of the limitations fixed by the narrow, 42-inch gauge. Service is further handicapped by severe grades, many bridges and tunnels, and it has been realized for some time that measures must necessarily be adopted to meet the requirements of increased service.

The change to a broader track gauge or the construction of additional trackage as a means of meeting the demand for more service could be accomplished only at a prohibitive cost. Electrification offered a reasonable method of providing for increased service and future expansion. By electrifying, heavier trains may be operated at higher speeds than are now feasible with steam operation, thus permitting greater headways and relieving the congestion because of the present frequent operation of light trains. Further, much of the passenger operation can be efficiently handled with multiple unit operation of motor cars (and trailers), reserving the freight and long through passenger runs for the locomotives.

Electrification of a portion of the more congested routes has been in effect for several years. The Yamate Line, which forms a belt line around the suburbs of Tokio and serves as an outer connection for most of the main lines radiating from Tokio, was electrified in 1910 and uses a line potential of 600 volts. In 1915, two additional tracks were laid and electrified to parallel the double track between Tokio and Yokohama in order to handle the local service between these two cities. In view of the contemplated extension of this electrification, a line potential of 1,200 volts direct current was adopted. Motor cars and trailers perform the service on these lines, the Yokohama cars running over a portion of the Yamate line, thereby requiring an arrangement of control to provide full speed operation on both 600 and 1,200 volts. The Yamate line will, however, eventually be changed to 1,200 volts.



Two 60.5-ton Baldwin-Westinghouse Locomotive operating on the Imperial Japanese Government Railways

A comprehensive study of the electrification scheme resulted in the decision to use 1,500 volts, direct current, for the trunk line electrification. This system has been used for motor car service, is conveniently adaptable to automatic substation switching, is permissible for third-rail operation (in tunnels) and permits efficient design for large railway motors suitable for the narrow gauge. Further, the adoption of 1,500 volts does not introduce apparatus of an entirely new classification from the present electrifications.

It is logical that the first step in the general plan of electrification should be where traffic is heaviest, hence the extension of the Tokio-Yokohama electric service to Kozu (fifty miles) is in progress. Eventually, the electric service will be extended westward on the main Takaido line to Kobe. In connection with this main line electrification, forty-two electric locomotives have already been purchased and orders placed for fourteen additional locomotives. This main Takaido line extends from Tokio through Yokohama, Numazu, Nagoya and Osaka to Kobe, thereby serving several large and important cities. The line is 374 miles in length and is double-track throughout, with four tracks between Tokio and Yokohama.

After the electrification of the Takaido to Numazu section, the next step in the general electrification program will probably be the electrification of a section of the Chuo line, which is seventy-six miles long and extends from Iidamachi, near the Tokio station, to Kofu.

The service on the double track line between Tokio and Kobe is heavy. There are operated daily, fourteen through passenger trains, half of them running on express schedules. There are also various local passenger trains operated over different sections, and a daily freight movement of three fast freight trains, seven through freights and various local freight trains. The gross tonnage for through freight trains probably never exceeds 650, and the average speed of freight trains is approximately ten miles an hour. The fastest schedule made by the through express trains is approximately thirty-two miles an hour.

Present passenger service is performed by a number of modern, superheater American Pacific type steam locomotives as well as the superheater 4-6-0 type. Freight service is performed by Mallet locomotives for severe grade work as well as the 0-10-0 and consolidation types for heavy freight duty.

Considering the condensed profile of the Takaido line, it is seen that, although the profile is of a rolling nature, the maximum grades of 2.5 per cent. occur in two adjoining sections between

* "Westinghouse International."

(Continued on page 583.)

The Nippon Hydro-Electric Power Stations

By G. Scott*

THE writer was invited by the Nippon Denryoku Company, Limited, of Osaka, to make a visit to their hydraulic generating stations to see the present and projected developments for power production.

The government railways run from end to end of Japan, for the most part at the foot of hills, running almost the full length of the islands, but there are no railways across country so that such a trip takes the traveler into places not usually visited.

Leaving Kobe about 6 p.m. we travel to Gifu, the starting point for the cross-country route, arriving about 10.30 p.m. Gifu is a small town in the hills not much frequented by foreigners and has no European hotels or food. The Nippon Denryoku Co., provided a stock of tinned foods which helped to vary the *menu* of the Japanese hotels, and the value of which was more appreciated by the writer than it is likely to be by the reader. Continuous meals of native food is *some* problem to a western digestive system and palate.

Gifu has a very curious fishing industry, carried on at night time by torch light. A special bird called "kamo" is trained to dive into the water and catch the fish which it brings to the boat and surrenders to the fishermen.

Fig. 1.—Sand Settling Tanks

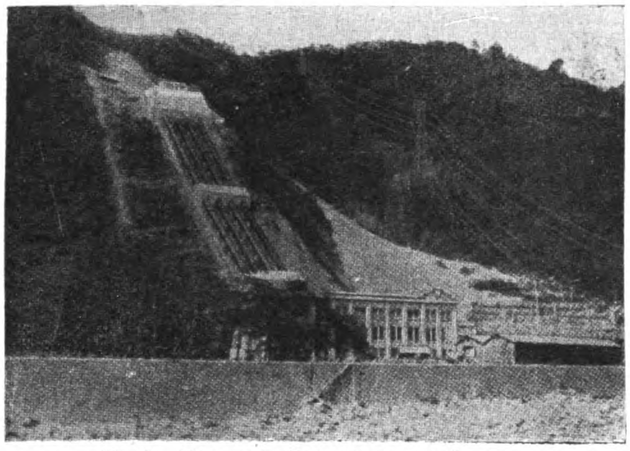


Fig 2.—Penstock, Pipe Line and Station

In a Japanese hotel it is usual to sleep on a "Futon" or downy mattress placed on the floor, and in the hot season under a mosquito net. There is no hardship about this as the bed is very comfortable, but the maximum annoyance can be caused by one little mosquito which lays in wait for you and as you raise the corner of the net to retire enters with you; he promptly begins to hum triumphantly and there is no peace till you lay him low.

We left Gifu at 6.30 a.m. by motor-car and arrived at our first halting place—Seto—about 1 p.m. Seto power station is on the River Masuda. This is the first station of the company to go into commercial service. Water is taken from the river about six miles further upstream. After traversing a short open canal, the water passes through sand-settling chambers (Fig. 1) and thence journeys through a tunnel, 15-ft. diameter, passing through four hills and finally reaches the penstock (see Fig. 2) and is passed through the turbine and discharged to the river.

In order to facilitate transport of materials to site an aerial ropeway 21 miles long was constructed. The transformers and switchgear for stepping up voltage from 11,000 to 154,000, and transmission tower, are shown in Fig. 3. Transformers are General Electric Co., and switchgear, American Westinghouse manufacture.

*Metropolitan-Vicker's Club News.

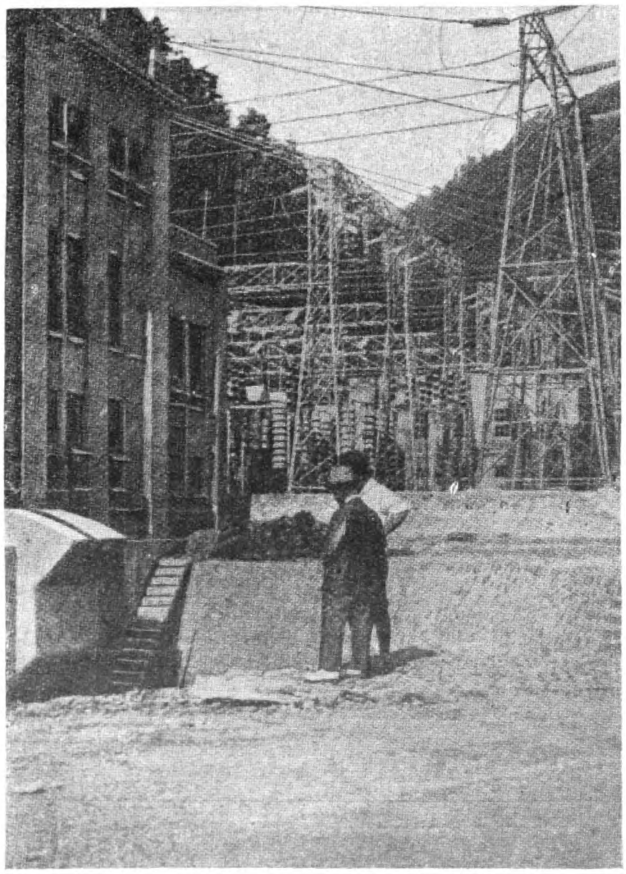


Fig. 3.—Transformers and Switchgear

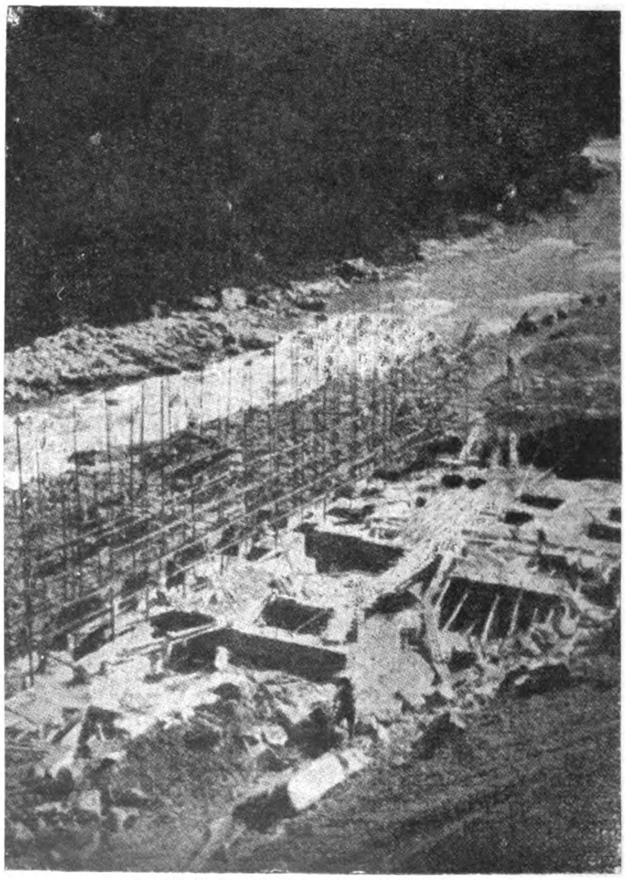


Fig. 6.—Power Station Under Construction

The Seto station has a capacity of 30,000 kw., the water head is 330-ft. and the water supply in dry season will carry half this load. On the same river will be constructed two other power houses.

Leaving Seto next morning, we pass the intake and sand-settling chambers and travel through mountainous country along the river until the highest point is reached, and the rivers flow in the other direction, *i.e.*, rivers so far flow to the Pacific ocean, hereafter they flow to the Japan Sea.

This days' journey finished at about 7 p.m. at Furakawa where motor-car was dismissed. The next stage of about 35 miles could not be taken by motor-car as the roads are not suitable, and we have recourse to the jinrickshaw, but with the added power of one dog. Try and picture the conditions, temperature in daytime about 95° F.! The start on account of length of journey and the mountainous nature of it is made at 6 a.m. The dog is called by a whistle, and trots into his harness without any fuss ; there is abundance of water from small streams down the hill sides and the " kuruma " or runner allows the dog to indulge in the luxury of a bath at very frequent intervals. This he revels in and very visibly enjoys, he quietly trots back into harness when called.

When properly under way the endurance of these men and dogs is amazing, they jog along mile after mile in the scorching heat, their feet shod with a kind of grassy sole roped round the ankle and across the foot. Thus for hours they pad along at a trot all the time ; they take meals about every three hours ; the dogs on easy down hill stretches, run ahead and find a cool pond to lie in. The course was along the Takahara river which ran hundreds of feet below us. The beauty of the scenery and freshness of the air, the fresh green appearance of newly-planted rice, and the murmuring of the river cannot be described by words or picture.

The route is through the very heart of the hills, high up on a ledge above the river, the well wooded hill tops are high above the road, the sun is higher up still, and the blue sky finishes a variety of scenes that cannot be portrayed. We arrive at Kanidera about 2 p.m., thus completing eight hours in this intense heat.

The power station here is under construction, and, as will be seen from the Fig. 6, is being tucked into a narrow space between the river and the hill side to the right ; this hill is very precipitous. Two units are being installed, 25,000 kw., the station capacity will be 50,000 kw., waterhead 440-ft. The foundations are solid rock ; the blasting operations reverberate through the mountains with echoes like heavy artillery. Special roads are being constructed to handle the heavy machinery arranged so that an easy angle of inclination can be obtained on the face of this very steep mountain. Smaller parts of about 500-lbs. weight are brought by aerial ropeway from Sasazu, which place they reach by rail from Pacific ocean port. The nearest railway is at Sasazu, about eight miles from Kanidera, and the road along these eight miles is alive with oxen or horse-drawn wagons, all bearing their burden to Kanidera. Three more stations will eventually be built on this river.

The company have a large substation at Sasazu, which is a collecting and distributing station for the locality as they have important holdings in other companies in this area.

We finish the day's journey at Toyama about 8.30 p.m., the last stretch from Sasazu by auto. Next day our journey commences with a short train ride to Mikkaichi and thence by a small electric tramway. As we are now at the edge of inhabited country and the base of the alps, we get an idea of the difficulties which this company has surmounted to obtain water power.

The electric railway just mentioned had to be built before any transport could be undertaken ; it is already 10 miles long and terminates temporarily at Unazuki, where also for preliminary purposes a power station of 1,600 kw. capacity, 530-ft. head has been built. The local bridge higher up the stream has been replaced by the steel bridge, to carry a railway across for the construction of the first station located about two miles further up stream. The water is largely from melted snow and the current runs at 15 miles per hour. There will be three stations on this river, aggregating 60,000 kw.

Observations, survey, etc., have been going on for 10 years past and records made of all the rivers mentioned herein. The Magasaki steam plant, contains two 25,000 kw. Metrovick turbo sets. The company have shown great enterprise and very considerable skill in location, organization, arrangement, and construction, and will be one of the most important supply companies of Japan.

All are to be congratulated from president downwards on having overcome so many difficulties, the transmission line from towers placed on hill tops miles away from the every-day track, the civil engineering, driving tunnels through mountains, etc., the financing of the whole business, all call for men of great capacity and enterprise, and we wish them all the utmost success.

Electrification of the Imperial Government Railways of Japan

(Continued from page 581.)

Yamakita and Numazu (near Mt. Fuji), totalling a distance of approximately 15.5 miles. These maximum grades will eventually be eliminated by means of a new route and a six mile tunnel now under construction by way of Odawara. Grades of one per cent. occur frequently on this line so that it seems advisable to select a road locomotive of such capacity that the train can be handled on the one per cent. grades without a helper, and for the initial operation, the same train to be handled on the heavy grades with a helper locomotive of the same class as the locomotive.

The Chuo line has several maximum 2.5 per cent. grades with curves of six degrees. One section, 20.6 miles in length, has an equivalent grade of 1.39 per cent.

It is for the purpose of meeting the service and conditions on these two lines that the locomotives recently ordered from the Westinghouse Company, and those ordered in 1922, will be used. Their design has been worked out to provide very favorable standardization of locomotives to meet all the local passenger and express passenger demands, and with some modification, the freight requirements of the imperial government railways. For the freight service, a lower speed gear reduction will be used and the guiding trucks omitted. The control will be modified only by the addition of regeneration equipment.

All locomotives will employ the simple, direct-geared, axle-hung arrangement of motors of the usual railway type. Capacity and speed variation for the different classes of passenger service will be obtained by variation in the number of motors and gear ratio. A very marked degree of standardization has been obtained in the design of the locomotives, in that the same motor is used in all three types as well as the same size wheels, unit switches and other individual pieces of control and brake equipment.

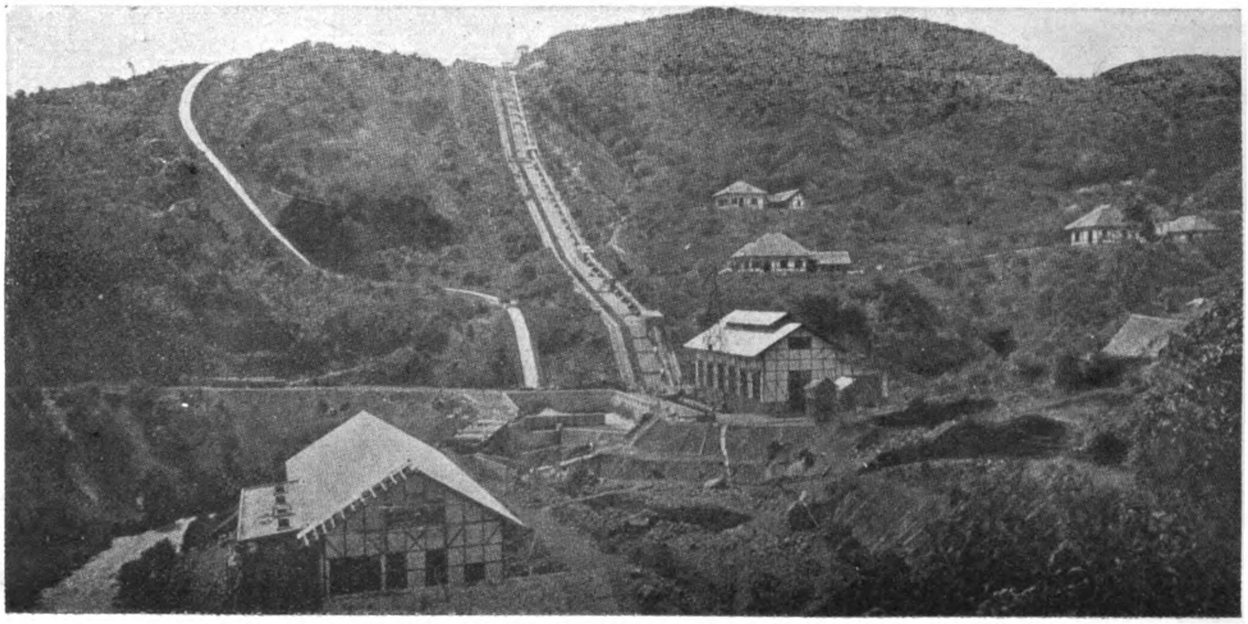
All locomotives will have a single box type cab, and for the passenger locomotives, articulated trucks will be used with frames of cast steel. The cabs will have two operating compartments, one at each end, and an equipment compartment in the centre. On the new locomotives flexible spur gears of the coil spring type will be used. Westinghouse air brake equipment combined with a vacuum brake system will be supplied as well as two hand brakes. Left hand drive, according to imperial government railway standards, will be arranged. Coupling of the standard MCB automatic type will be provided as the imperial government railway is changing over from the continental type which has been standard.

The main motors are known as the type 352, which have a nominal rating of 300 h.p. and are suitable for operation, two in a series, on 1,500 volts. This motor was specially designed and built for the imperial government railways electrification and embodies the characteristics necessary for the service and track gauge. It is arranged for field control and forced ventilation.

The control is of the double end, Westinghouse type H.B.F., embodying a 32-volt battery supply for operating the electro-pneumatic switches which are employed for all main circuit switching. Air operated pantagraphs of special design are employed.

Six of the locomotives will be of the 2–4–0+0–4–2 type. The approximate total weight will be 153,100 pounds with 114,000 pounds on the drivers. The motors will be the same as those supplied on the experimental locomotives, giving a total nominal rating on 1,500 volts of 1,200 h.p. a cab.

Two of the locomotives will be of the 2–6–0+0–6–2 type. They will employ the same type motor and gear ratio as the 2–4–0+0–4–2 type. The two types will be as similar as it is possible to make two such locomotives of different wheel arrangement. These locomotives have a nominal rating of 1,800 h.p. and are intended for use in high speed express passenger service on the Takaido line. They will be capable of handling a 460 ton train under the average conditions for this class of main line service. The speed with this weight of train will be approximately fifty-three miles an hour on straight level track.



Plengan Hydro-Electric Power Plant on the Saroewa River (Preanger), Java

Hydro-Electric Development in N.E.I.

SINCE 1910 the water-power problem for the N. E. I. has had the attention of the government, in the beginning only with a view to the future electrification of the state railways, later on, in a broader sense, in interest of a better supply of energy as a chief factor for the industrial development.

The service for water-power and electricity, which was created in August, 1917, is an independent section of the department of government services. This new section has been given the task to promote a supply of economical energy for the territories, which are in want of it, to make a proper use of the country's water-power and to give every assistance, not only in the interest of the industrial development of these districts in general, but also for the benefit of the state railways and other government services.

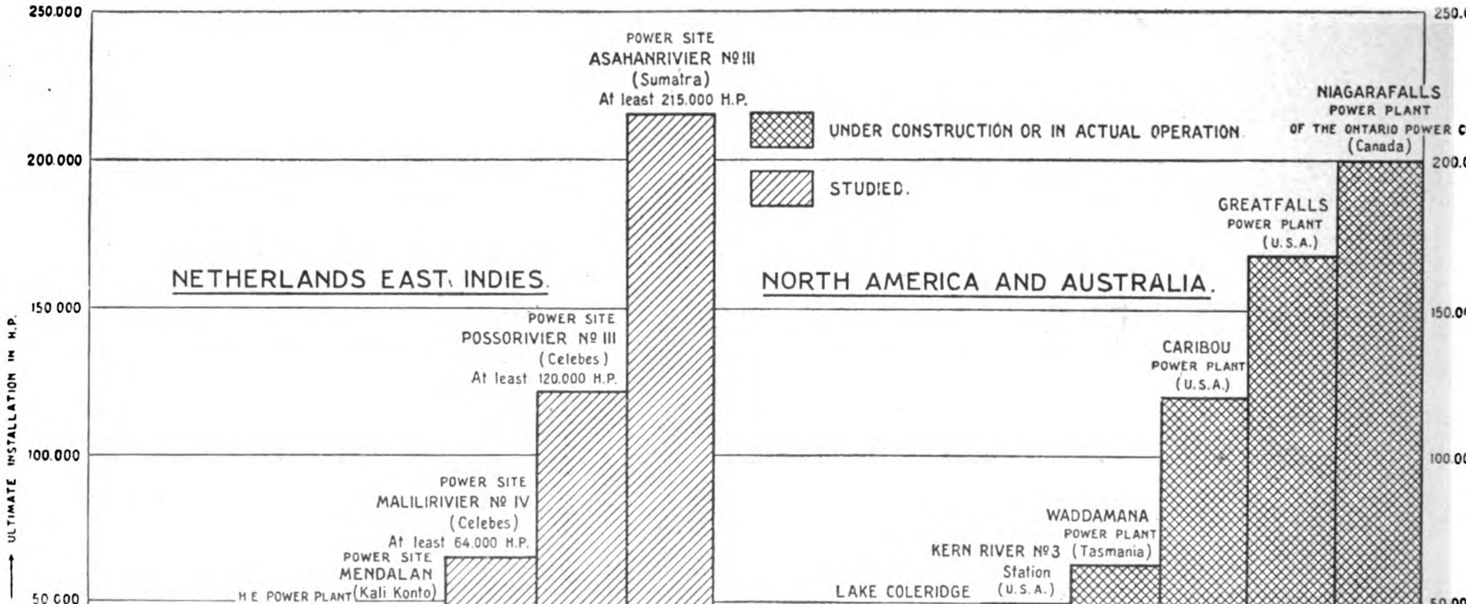
To fulfil this task the following measures were taken :—

1. The building of state water-power works, not only for industries and services already existing, but also for supply of electrical power in general.

2. State exploitation of power stations and participation of the state in other electrical industries for the distribution of the energy.

3. The establishment of a water-power cadastre to give expert advice to interested parties regarding water-surveys, water-power wells and concessions.

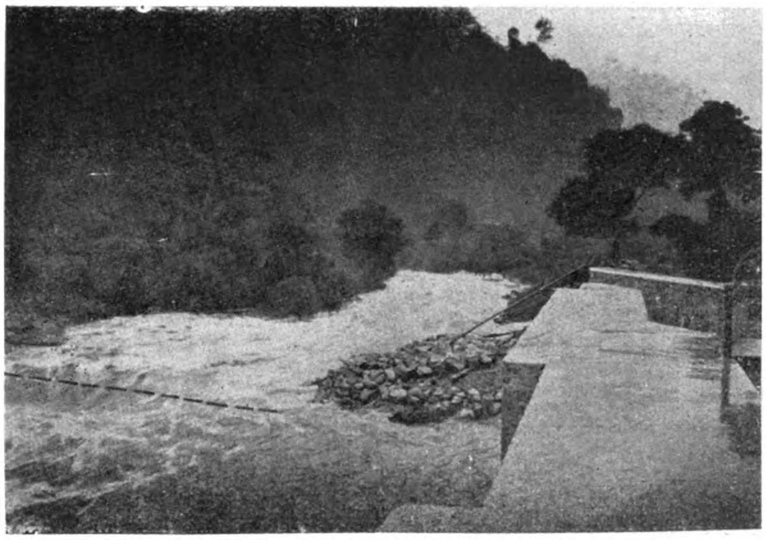
4. Revision of the water-power and electricity regulation.



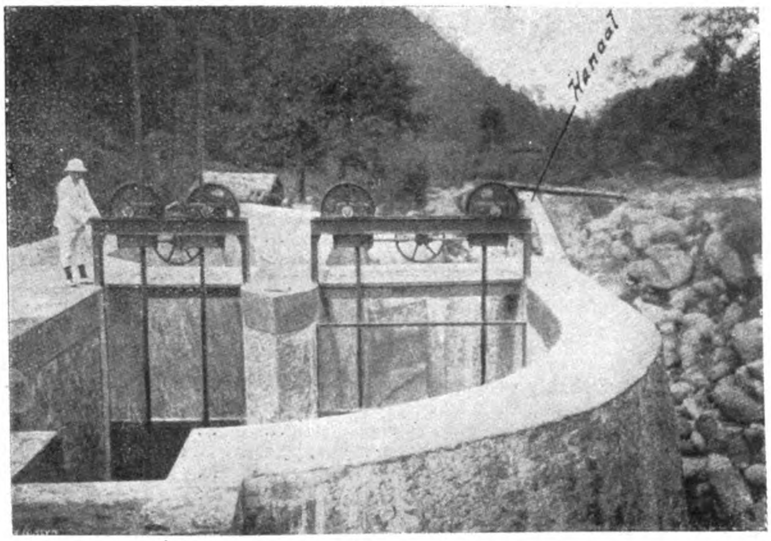
Capacity of Some Water Power Plants and Sites in the N.E.I. compared with Plants in America and Australia

TYPICAL HYDRO-ELECTRIC INDUSTRIAL POWER PLANT IN THE N.E.I.

The Power Plant of the Netherlandshe-Indische Portland Cement Works at Padang, Sumatra



Inlet Gate on the Loeboek, Kitangan River

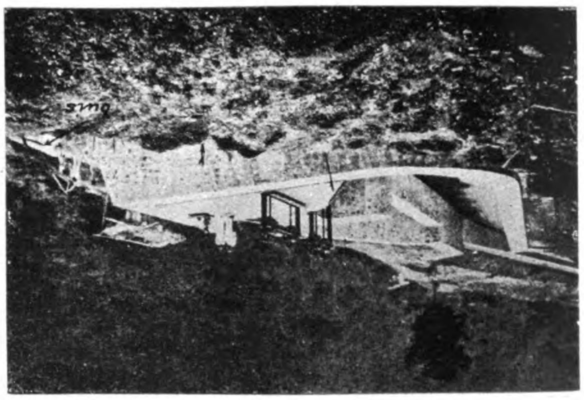


Sluice Gate at Inlet

To divide the above-mentioned task in a practical way, the service possesses, besides an administrative, three technical sections, viz., the hydro-technical, electro-technical and the building section, which are all established at Bandung. *The hydro-technical section* includes

The Canal

Flume to Turbine

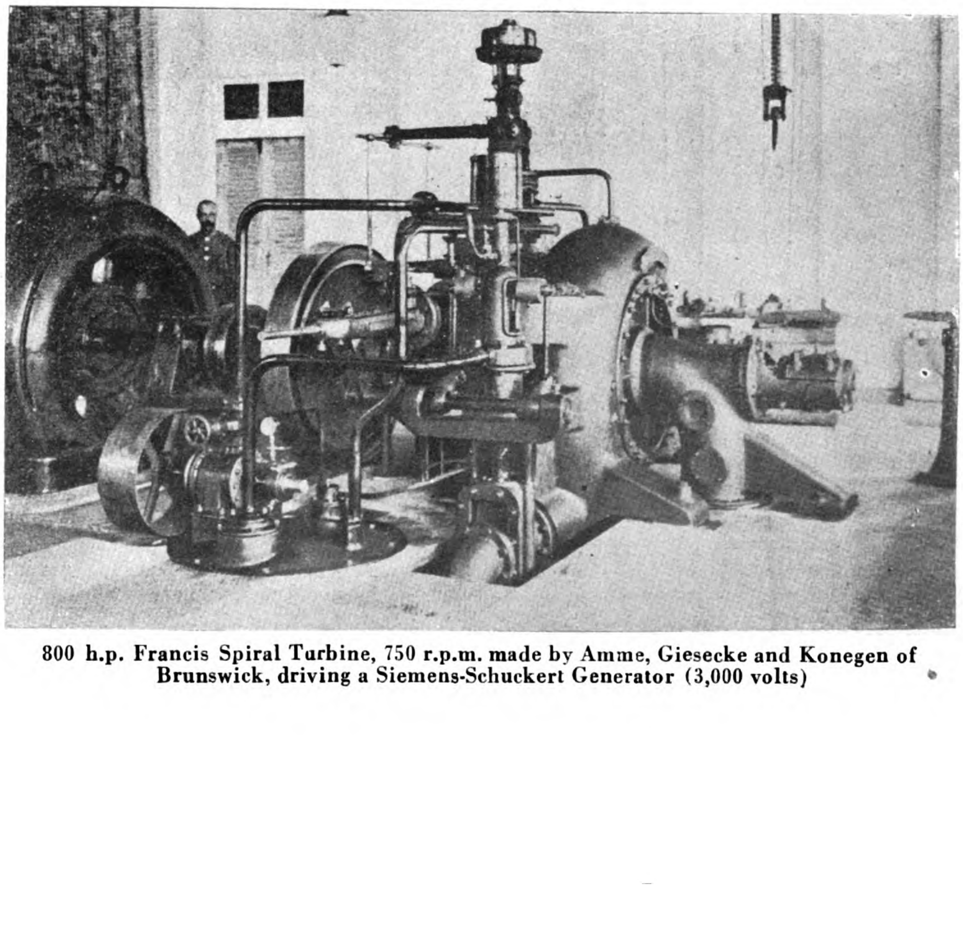


Canal End and Entrance to Flume

the following operations:—

(*a*) *Research for and the making of an inventory of water-power.* On the whole the natural conditions for the exploitation of water-power in the N. E. I., may be considered favorable; as especially favorable factors should be mentioned: the large annual rainfall, the appearance of large lakes, suitable for accumulation—especially in the outer districts—large falls owing to the mountainous nature of most of the islands and the absence of a winter season with, as a consequence, the elimination of the drawbacks of snow and ice.

On the other hand the unfavorable circumstances are the prevalance of a characteristic dry season (east monsoon), the rarity of good solid rock bottom and, as a consequence of this, the mostly necessary long survey for the pipelines.



800 h.p. Francis Spiral Turbine, 750 r.p.m. made by Amme, Giesecke and Konegen of Brunswick, driving a Siemens-Schuckert Generator (3,000 volts)

According to a rough estimate, whereby, for a large part, the still unknown, but probably in water-power very rich New Guinea is not included, in the N.E.I. 5½ million h.p. are exploitable for works of more than 1,000 h.p. This capacity is divided as follows over the various islands:

	H.P.
Java ..	500,000
Sumatra ..	2,000,000
Celebes ..	1,000,000
Borneo ..	2,000,000
Total ..	5,500,000

Survey of water-powers exploited and exploitable at the end of 1922 :

JAVA

		Tower in H.P. Minimum in dry season	Average in 9 months
Surveyed but probably not exploitable		240,000	410,000
Not further surveyed, economically exploitable powers of more than 500 h.p. average capacity		400,000	690,000
Examined by the government of which	completely surveyed, planned and estimated	83,300	153,500
	under construction	9,900	22,100
	constructed and working ...	3,700	7,150
Granted the concession of which	construction not yet started ...	4,880	9,950
	under construction	3,720	6,580
	constructed and working ...	3,910	5,420
Used according to permits until further notice		10,000	13,700

OUTER DISTRICTS.

		Power in H.P. Minimum in dry season	Average in 9 months
Surveyed but probably not economically exploitable ...		—	—
Not further surveyed, economically exploitable powers of more than 1,000 h.p. average capacity		1,858,000	2,852,000
Examined by the goverment of which	completely surveyed, planned and estimated	530,000	727,000
	under construction	—	—
	constructed and working ...	2,000	2,000
Granted the concession of which	construction not yet started ...	219,000	316,000
	under construction	—	—
	constructed and working ...	3,800	5,450
Used according to permits until further notice		6,500	6,500

The energy exploited by the government is divided over the following power stations (at the end of 1922) :—

Name of the power-station	Purpose	Installed Energy in h.p.	9 monthly power of the works in h.p.
Java			
1. Tji Geureuh I	Supply of current to...	200	200
2. „ „ II	the Radio Station Malabar	350	350
3. Plengan		4,500	2,300
4. Bengkok	Energy supply of Bandung and vicinity and Malabar Radiostation	4,500	3,000
5. Giringan	Energy supply to railway workshops and illumination of Madiun ...	2,000	2,000
	Total *Java* ...		7,850
Sumatra			
1. Teis	Energy supply to state and private gold-mines	2,000	2,000
	Total *Java* and *Sumatra* ...		9,850

At the end of 1922 the following power-stations were under construction :—

Name of the power-station	Purpose	Energy to be Installed in h.p.	9 monthly Energy of the Works in h.p.
Java			
1. Kratjak	Electrification in and around Batavia	24,000	8,000
2. Ubrug	general energy supply for various places	21,500	7,500
3. Dago	Energy supply in Bandung and surroundings and Ma-	1,000	900
4. Lamadjan	labar radio station	27,000	10,000
	Total *Java* ...		26,400

Of all the powers mentioned above—those already in use as well as those not yet used or given in concession—the principal details as to situation, capacity (drop and output), existing topographical surveys, accumulation possibilities, etc., are systematically registered in the *water-power cadastre.*

This water-power cadastre is accessible to the public ; private individuals who wish to use water-power, can get information free of charge as to what is known already about the appearance of the power energy in rivers, or irrigation-canals suitable for their purposes. If necessary the available hydrographical and topographical data can be supplied against a small remuneration.

(*b*) *Water Surveys.*

At the end of 1922 there were in all 72 water-survey stations. These are spread as follows over the various districts :

1. In Java 55, of which 29 are provided with self-registering instruments ;
2. In Sumatra 10, of which 3 have self-registering instruments ;
3. In Celebes 7, of which 4 are fitted out with self-registering instruments.

By regular daily gauges of the waterlevel and periodical gauges of the discharge by means of hydrometrical mills and by a chemical system (in 1922 311 gauges were made in all), the daily output is fixed at these stations. The results of these gauges are published yearly in bookform.

(*c*) *Preliminary Plans and Estimates of Cost.*

For the water-power works to be built by the government for the general electrical supply and for certain government enterprises, the necessary detailed plans, estimates and calculations of productiveness are made. At the end of 1922 of such plans were in hand :

The supply of energy for Sourabaya by means of water-power from the river Konto (capacity : 11,500 h.p. constant power) and the extension of the supply of energy by the Bandung highland, by increasing the existing reservoirs and power-stations of the Tji Sangkoej.

Similar preliminary plans are, if needed, also worked out for provinces or Boroughs, and in special cases even for private concerns.

(*d*) *Handling of Applications for Water-power Concessions.*

All applications for the granting of water-rights are examined, and a report submitted to the bodies who must grant these rights.

In the N. E. Indies there are two kinds of permits for the use of water-power.

(*a*) permits until further notice for power below 100 theoretical h.p., exclusively for own use, and

(*b*) permits for a duration of 40 years for power of more than 100 h.p. theoretical power, intended also for supply of energy to others. The first mentioned permits are exempted from payment; for the latter permits (concessions) a yearly water-tax is charged amounting to :

glds. 2.—per theoretical h.p. for the first 900 h.p. above 100 ;
„ 1.50 „ „ „ „ „ following 9,000 h.p. ;
„ 1.— „ „ „ „ „ power above 10,000 h.p.

Applicants for permits, if they desire so, are supplied with all available details regarding the appearance of suitable sources of energy and information of the construction.

Typical Estate Factory near Medan, Sumatra, East Coast, operated by Electricity produced by Water-power

The quantity of economically exploitable power known is mentioned before. The size of these various sources of energy to

be used in a single work, compared to those of foreign works, may be seen from the diagram, printed on page 601.

The electro-technical section has the task of studying and working out plans for the mechanical and electrical installations of new steam and water-power works and to extend existing power-stations, which are under the department of government services.

Furthermore this section gives advice to other government institutions, and especially to local resorts, regarding matters belonging to their sphere of activity.

It exercises, according to the principles accepted by the government, the "electricity politics," which must lead to an electricity supply as rational as possible of the territory of the N.E.I. In connection with this, it deals with all applications received for the construction of local electric works, and supervises the execution of the permits granted.

Electrical problems of general interest are studied up, among which must be mentioned the making up of regulations, the promotion of normalization, and the collection and working out of statistical details.

At the beginning of 1923 the total of the generator power of 105,200 k.w. installed in the N.E.I. was divided as follows :

	Water-power	Caloric Centrals	Total
Public electrical works ..	2.400 k.w.	22,800 k.w.	25,200 k.w.
Government enterprises ..	8,600 ,,	17,200 ,,	25,800 ,,
Private industries ..	8,400 ,,	45,800 ,,	54,200 ,,
Total	19,400 k.w.	85,800 k.w.	105,200 k.w.

In all there are in the N.E.I. 20 cities in possession of public electric works.

Electric Cars for the Java State Railways

In its program of railway electrification the Java State Railways is equipping with modern motor cars and trailers for suburban passenger service, a section that includes the cities of Batavia and Meester Cornelis.

The cars themselves are being built and the wiring conduit and some of the lighter parts of the electrical equipment put in, by the Royal Car Works of Haarlem, Holland—Koninklijke Fabriek Van Rijtuigen en Spoorwagens, a concern that has been in the business of making railroad cars since 1838 and is still owned and managed by descendants of its founder, Mr. J. J. Beijnes.

There are thirty cars on order, half of them motor cars and half of them trailers. Five will be driven by Westinghouse motors and ten by motors of the General Electric Company. The trolley voltage is 1,500 d-c. and each motor car will carry a motor-generator set to supply 65-volt current for operating the control mechanism and air compressors, supplying the lights and charging the storage batteries. In tropical Java, no less than in the subways of New York, fan motors are essential and the so-called subway type of ceiling fan will be used in motor cars and trailers. Electro pneumatic control is provided for opening and closing the doors.

An interesting thing about these cars is the large number of countries from which their essential parts have been gathered. Their all-steel bodies, built in Holland, have roofs of teak wood, brought from India and covered by rubberoid made in the United States. The floor material comes from France, window glass from Belgium, and mahogany for the interior trim from Cuba. Switzerland supplies wiring devices and Canada asbestos linings. Truck springs are furnished by the Krupps, Germany, while the Westinghouse air brake equipment comes from England. Belgium furnishes wheels and axles and the couplers which are the American MCB type with an additional device for coupling in emergency to the existing steam trains. The Holland made car bodies have American standard vestibule buffers. The contribution of the United States includes pneumatic door opening mechanism of the Consolidated Car Heating Company, Albany, car seats from the J. G. Brill Company, Philadelphia, rubberoid of the Standard Paint Company, New York, and the entire electrical equipment. The latter comes from the two American companies, previously referred to, and from the Electric Storage Battery Company of Philadelphia, whose exide batteries are employed.

Gathered together and assembled by the Netherlands government, it is permitted to speculate as to whether this international assemblage would be brought before the Hague, the World Court or a similar tribunal, in the event of any failure of the constituent parts to function in friendly co-operation. It is our opinion that there will be no such occasion and that on the contrary the success with which these mechanical representatives of many countries work together for a common purpose is likely to be an object lesson worth pondering by those who guide the destinies of nations.

Prior to the assembly of the electrical equipment on the cars in Java, a sample car was fitted out in Holland, under the direction of engineers of the department for the colonies assisted by Mr. E. E. Carrier, of the General Electric Company, who will supervise the assembly of the remaining cars in Java.

Mr. Carrier, at the time of the shipment of the sample car from Haarlem, wrote as follows : "The care taken by the car builders in the workmanship and finish of these cars cannot be surpassed anywhere in my opinion."

Another General Electric engineer, Mr. J. R. Johnson, is in charge of the erection of a substation at Meester Cornelis. This is a 3,000-k.w. plant and includes two 1,500-kw., 1,500-volt three-unit synchronous motor-generator sets, operating from a three-phase, 6,600-volt power supply that is drawn from a 70,000-volt hydro-electric system.

First Turbine-electric Driven Ocean Liner for the Pacific Trade

MORE than passing interest attaches to the announcement that the Matson Navigation Company of San Francisco has adopted turbine-electric drive for the latest of its passenger carrying ships for service between San Francisco and Honolulu.

For the past ten years ships of other types have been thus equipped but this new boat will be the first in the oversea passenger liner class to make use of turbine-electric propulsion. She will be built by William Cramp and Sons, Ship and Engine Building Company of Philadelphia, and her naval architects are Gibbs Bros., Inc., of New York, who specialize in the design of ocean liners.

She will be a twin-screw ship of 17,500 tons displacement, 24,000 horse-power, 21 knots speed, length 578-ft. and beam 76 ft. There will be accommodation for 600 first-class passengers and a crew of 250.

In choosing turbine-electric drive, ship owners are assured of certain advantages, among which is one of outstanding importance, because of its effect upon the continued maintenance of sailing schedule. It may be expressed in a single word that is full of meaning, *reliability*. It has been shown by the performance of other ships over a period of years that the turbine-electric drive is reliable; it possesses the element of simplicity of mechanism and this implies a long continuous service with but little overhauling.

Instead of direct mechanical connection between the prime mover and the propeller, or connection through gears, the power is transmitted through magnetism and that provides a degree of cushioning that absorbs mechanical shock. This in combination with perfectly balanced high-speed machinery eliminates vibration and makes for smooth and quiet operation, features most desirable in all types of ships but particularly to be desired in a passenger liner.

The comparatively small number of wearing surfaces and the ease with which electrical machinery can be repaired when necessary, are characteristics that aid in the keeping of the equipment in good condition through long periods and in shortening the time that a ship must be out of service for overhauling. This it will be recognized has a direct bearing on the maintenance of schedule and therefore on income derived.

Electric ship propulsion is no longer a novelty and it passed the experimental stage some ten years ago. It required faith, however, to make the first installation, because at the beginning it seemed like a revolutionary thing to depart so radically from the long approved practice of marine engineering and adopt something that had never been given a trial on the sea. A big electric plant might be perfectly satisfactory when anchored to the ground but what would it do when floating and buffeted by winds and waves ?

Besides the great and smaller vessels of the navy, electric drive has been applied to ships of the merchant marine and harbor craft, some using turbines and some Diesel engines as prime mover. In the class of trans-oceanic *passenger* liners, however, the Matson line ship is the first to be equipped for turbine-electric propulsion.

Gold Mining in the Philippines

By Dr. Francisco Villanueva Conlu

Gold Mining, an Ancient Industry

MINING for gold was practiced in the Philippine Islands long before the advent of the Spaniards. There is scarcely a province in the archipelago in which gold has not been obtained by the natives, who are skilful pan miners and clever in dealing with accessible quartz. Chinese writings of about the third century, A.D., report gold as the chief product of Luzon, one of the most important and largest islands of the Philippines. Before Magellan's arrival the Filipinos carried commerce with China, and they paid for silks and other Chinese manufactures in gold and other Philippine products. Alluvial deposits accessible to the Chinese and Malay traders, who had intercourse with the islands long before they were known to Europeans, have been to a great extent worked over and over again. The natives used as tools a washing board and a wooden bowl. Bowlders and fragments of quartz with visible gold occur in many alluvial deposits in the islands. The ancient process was by pulverizing the quartz by hand and washing it like they wash the auriferous gravel and sand. When the Spaniards came they introduced an improvement on this rude process, consisting of the so-called "Mexican arrastra," a block of rock moved by buffalo power like a millstone on another block. The charge of an "arrastra" is about 250 pounds. After the American occupation of the islands, much activity in prospecting and development work was shown in several districts by American miners, and modern mining machinery was imported to the country from the United States and up-to-date methods employed in working the claims.

Centre of the Antamok mining district, where most gold claims of the Benguet subprovince are located

Gold Mines Discovered

Gold is the first in importance of the metallic mineral resources of the Philippines. According to the census of the Philippine Islands taken under the direction of the Philippine legislature in the year 1918, gold has been found in the following provinces: Agusan, Benguet, Bukidnon, Bulacan, Camarines Norte, Cebu, Iloilo, Lepanto, Mindoro, Misamis, Nueva Ecija, Nueva Vizcaya, Pangasinan, Romblon, Sorsogon, Surigao, Tayabas and Zamboanga.

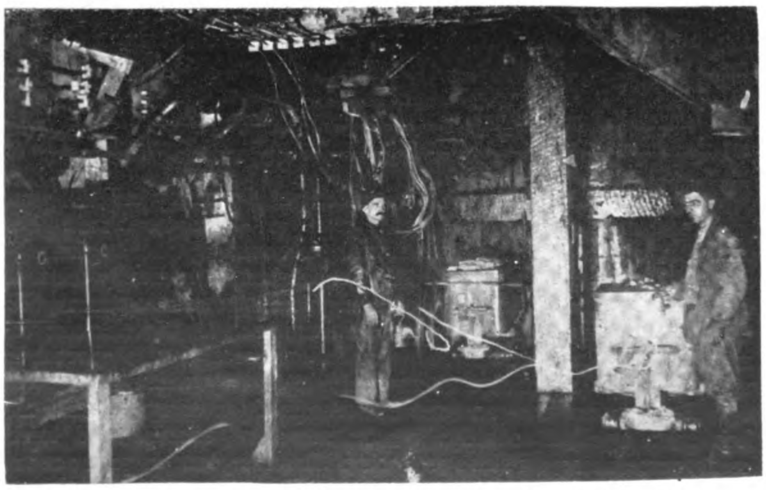
In most cases the gold that is found is detrital, and is found either in existing water courses or in stream deposits now deserted by the current. These last were called "aluviones" by the Spaniards. Of all the auriferous provinces, Benguet, Masbate and Ambos Camarines are rivales for first place in the metal output and in general mining activity.

The gold ores in the Benguet region are partially free milling, but for the most part refractory. The gravels of the river Agno carry gold. A further description of the Antamok mining district in Benguet will be made in a later paragraph. In the provinces of Bontoc and Benguet the deposits are in all respects analagous to those of Lepanto. Gold has been mined for centuries both from veins and placers. Since American occupation the mountain range has been prospected by Americans, and several hundred claims have been located.

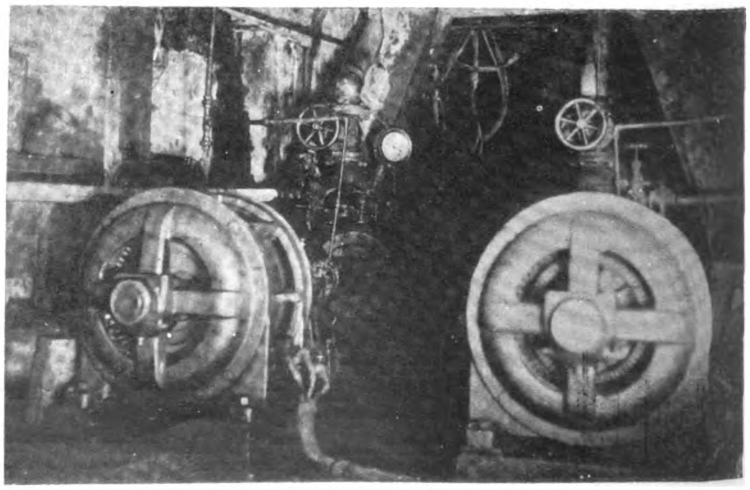
In Camarines Norte, the townships of Mambulao, Paracale and Labo, are especially well-known as gold-producing localities. Here quartz veins are found, carrying besides gold, iron pyrite, copper pyrite, galena, and zinc blonde, sometimes also accompanied by lead chromate. At Paracale there are parallel quartz veins in granite, one of which is said to be 20-ft. in width and contains a chute in which the ore is reported to assay 38 ounces of gold to the ton.

In the province of Abra, at the northern end of Luzon, there are placers, and the gravel of the river Abra is auriferous. There gold is found in alluvial deposits, and in the sands of the river of the same name, as grains, and has an average fineness of 0.750 to 0.792.

In the province of Lepanto gold occurs in three different ways in veins, in alluvial deposits and in river sands. Its fineness is



Two American miners doing work in the power plant of the Benguet Consolidated Mining Company



Power plant of the big American mining corporation, The Benguet Consolidated Company

from 0.792 to 0.833 and it is somewhat light colored because of a considerable silver content. It is usually accompanied by ores of silver, copper, iron and lead. Gold is obtained in this province close to the copper mines.

In the province of Nueva Ecija the gold is exceedingly pure, brilliant in color and 0.958 fine. It is found as rounded particles in alluvium and sometimes in small crystals.

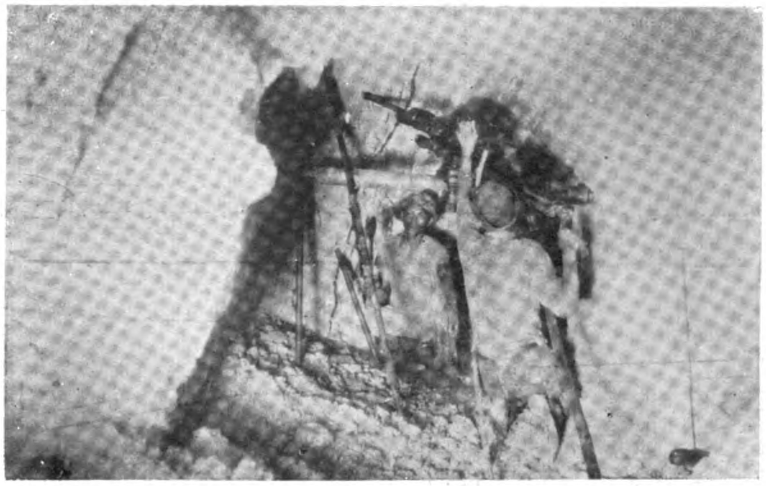
In Mindanao some of the gravels are in an elevated position and adapted to hydraulic mining. In this island there are two known gold-bearing districts. One of these is in the province of Surigao, where placer and other townships show gravels and veins. The second district is in the province of Misamis. Near the settlement of Iponan, on the Gulf of Macajalar, there are said to be many square kilometres of gravels carrying large quantities of gold, with which is associated platinum.

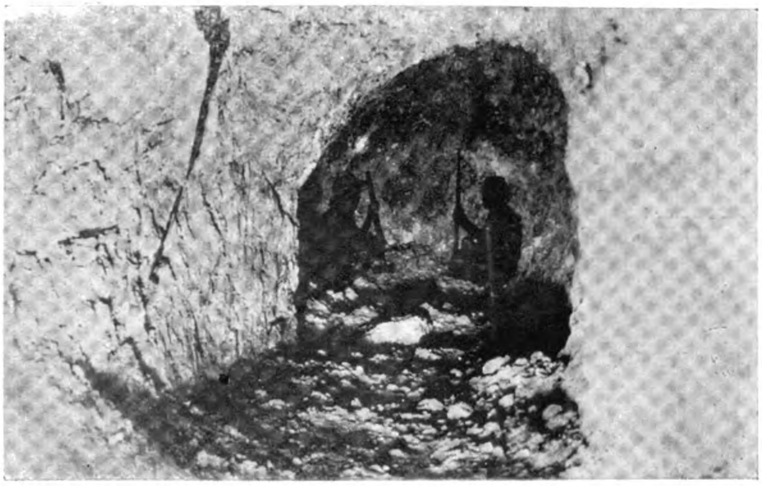
The Mines of Antamok, Benguet

Antamok, a region down the sub-province of Benguet, is the best Philippine gold mining district. It lies on a direct line south of Tubia some ten miles. Here geological conditions change somewhat and the vein and ledges become much stronger. On certain claims in this district a distinct contact of diorite with syenite occurs, but the ledges are lying on granite porphyry, which lies between the quartz and the syenite. The ledges are large, having a mean thickness of 12-ft. However, there are segregated stringers of extremely rich gold ores running out into the serpentine porphyry which have been unquestionably, by reason of secondary fissuring and ore deposition, extracted by agencies of water and hot gasses, from the main ledges and the porphyries, which are always great feeders to veins. The syenite occurs on the west side or the footside of the contact, while the hanging wall side is composed of quartzose diorite. There are also many veins in the diorite due to subsequent fissuring after the cooling of the quartzose diorite and occur in most all instances with porphyry and serpentine extruded through the later fractures or fissuring. These saprolitic veins or veinlets carry gold and some of them are extremely rich. This camp is only 6 miles northeast of Baguio, the capital of Benguet, and with plenty of water at hand for all power needed to operate machinery.

Exploration of Mining Claims

Upon the passage of the Philippine act, the act of the United States Congress of July 1, 1902, the mineral deposits in public lands in the Philippine Islands were declared to be free and open to exploration, occupation and purchase, and the land in which they are found to occupation and purchase, by citizens of the United States or of the Philippine Islands, and in pursuance thereof an enactment was passed by the Philippine commission prescribing regulations governing the location and manner of recording mining claims, and the amount of work necessary to hold possession of a mining claim. The administrative work with reference to titles to mining claims is in the hands of the Bureau of Public Lands, and the Bureau of Science has charge of the work of effectively carrying out reconnoissances of the important mineral regions of the Philippines in order that accurate information of value to the prospector, the miner and the capitalists, may be made available, and the development of the mining industry may be stimulated.





Filipino natives drilling

American Miners and Mining Companies

Numerous claims have been located in the mining provinces and several companies have been organized to develop and operate a number of the most important groups. The success of some of the companies which have entered the field, to judge from their continuous operation and constant output, may be considered assured. For instance, there stands in the Antamok district, the Benguet Consolidated Mining Company which operates upon an investment of about P.2,000,000 in modern machinery and equipment.

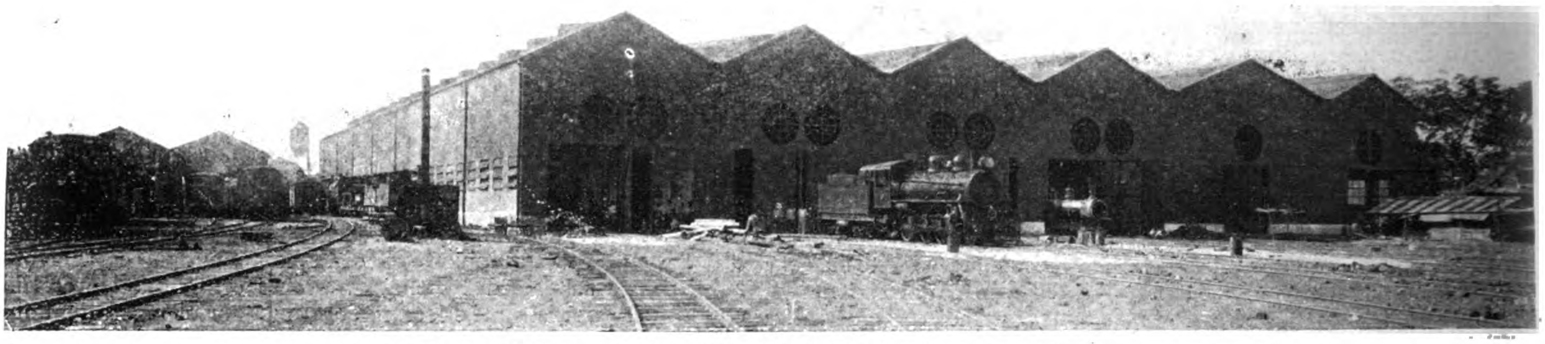
The number of American citizens who are engaged in mining all around the Philippine archipelago amount to about one hundred They are rendering a very valuable service to the mineral industry.

Diesel-Electric Tanker for the Pacific

FOLLOWING the satisfactory operation of two Diesel-electric tankers now in its service, the Standard Oil Company of California has ordered a third which, it has been reported, will operate between San Francisco and the Hawaiian Islands. This tanker will be similar in all respects to the two others with one exception ; the engine room will be amidships and the propulsion motor, aft. In the previous craft, the engine room was aft.

The new tanker will have an overall length of 221-ft. ; length between perpendiculars, 210-ft. ; beam, molded, 36-ft. ; depth, molded, 16-ft. 6-in. ; approximate mean draft, loaded, 13-ft. 6-in. Power will be generated by two 245 kilowatt, Diesel engine-driven generators, normally to operate in series. A 30-kilowatt generator, using the same shaft, will be included in each set for excitation purposes and auxiliary power. Propulsion power will be furnished by one 600-horsepower, 130 r.p.m. motor, driven by the main generators. The auxiliary generators will operate alternately, one acting as a stand-by for the other.

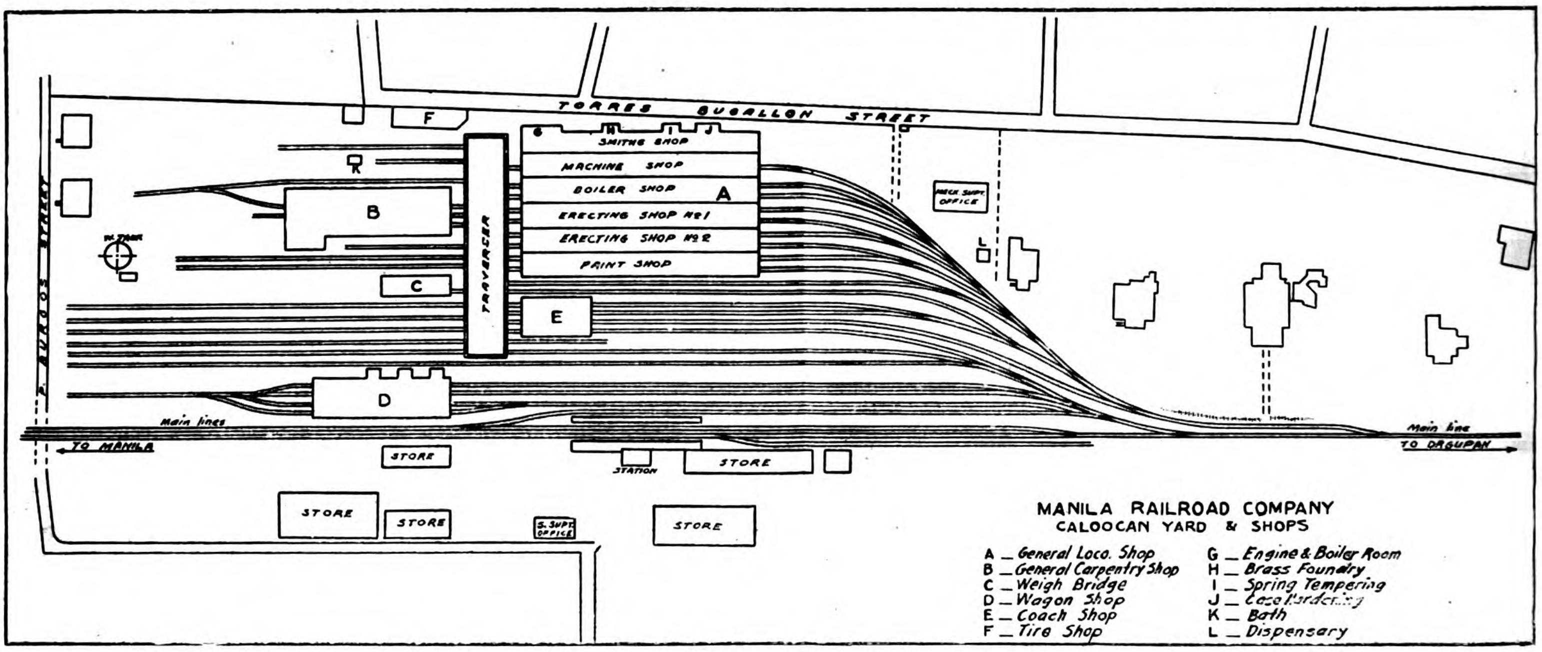
In addition to the propulsion equipment, electric power is used for auxiliaries above and below decks. All the electrical machinery is General Electric manufactured by the General Electric Company of America. Below decks, electric power will drive ventilating and pumping apparatus and a five-kilowatt generator will carry the auxiliary lighting load. The deck auxiliary machinery will include anchor windlass, cargo winch and capstan motor equipments.



Machine and Erecting Shops of the Manila Railway Company at Caloocan

The Caloocan Shops of the Manila Railway

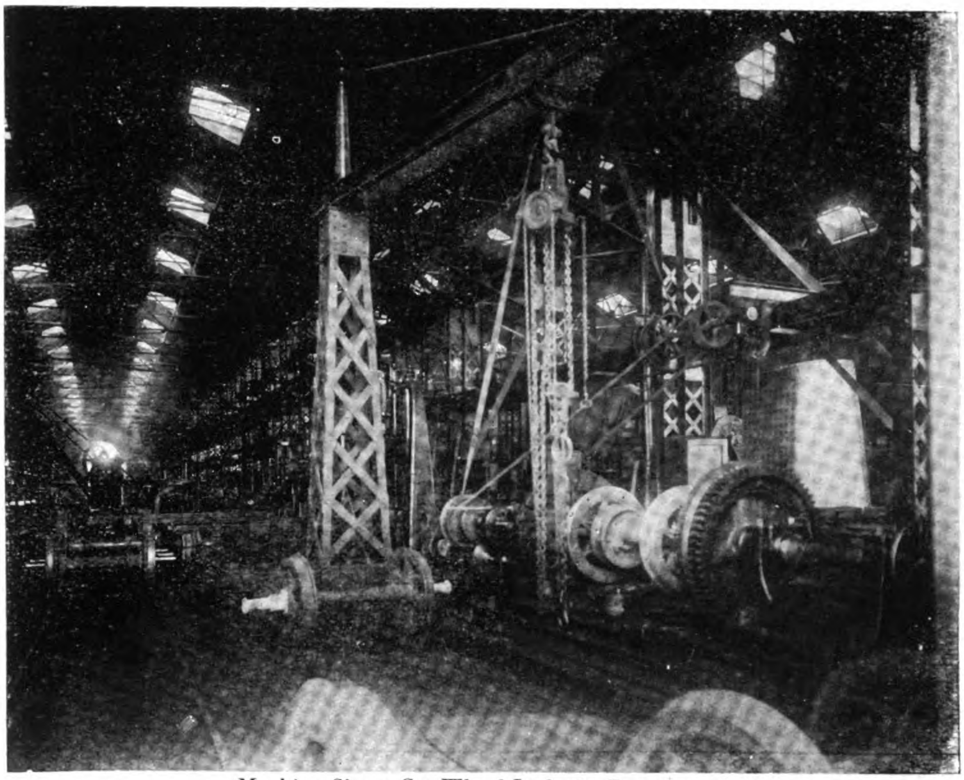
THE Caloocan machine shops of the Manila railway cover an area of 77,040 sq. ft. and have just recently been extended and equipped with modern machinery. The building is of latticed steel columns, sides and roof of corrugated iron. The arrangement of shops is as follows and can be followed by reference to plan herewith :



The large building marked " A " consists of blacksmith's shops, coppersmiths, and machine shop, under one span. Boiler-maker and plating shop adjoining, with four pits the full length of shop, under two other spans. The blacksmith shop houses 12 forges, with 10 tons steam hammer, coppersmith shop has three fires and two tube welding furnaces, with a Thompson electric welder for steel tubes and for superheat flues. Adjoining the coppersmith shop is a case hardening furnace, as also a small brass foundry with a three pot furnace.

The machine shop is 360-ft. long by 45-ft. wide and contains 29 lathes, grinding machines, slotters, planers, drills-radial and stationary, milling machine, large wheel lathes, boring mill, lapping machines, thread cutters. The shafting runs both sides of shop, is mounted on ball-bearing pedestals, and is driven by a 270 h.p. engine supplied with steam from two Lancashire type boilers 30-ft. long by 8-ft. $2\frac{1}{2}$ dia. The boilershop is 360-ft. by 35-ft. wide and is capable of holding 30 boilers, both large and small at one time;

Workmen Checking out at Noon



Machine Shop: Car Wheel Lathe in Foreground

this shop is equipped with a 20-ton traveling crane, 3 forges, a set of rolls, and punching and shearing machine capable of working 1-in. plate.

Portable electric welders are in the boiler and erecting shops, and a fixed two arc is in the building marked "C." Oxy-acetylene cutting torches and welding are portable and can be taken where required.

The two erecting shops are 360-ft. by 35-ft. wide and are fitted with drop pits in each bay capable of lowering and lifting 10 tons; in the first bay there are two 30-ton overhead traveling cranes and in the second bay there are two 50-ton overhead traveling cranes capable of lifting the latest and heaviest locomotives.

The whole of these bays are supplied with compressed air at 100-lbs. the drop pits also being worked by this medium.

The last bay of the six is the paint shop, where also are placed fitters' benches for vacuum brake work and the internal mechanical parts of coaches.

Across the way from machine shop is the coach building and carpenter's shop, 256-ft. long by 71-ft. wide, marked "B" and in this building are housed the tinsmiths and electrical departments. At the far end of the carpenter's shops is the machinery bay for sawing of logs, planing and jointing machines, saws, band and re-saw, morticing machines and universal joiner.

The building marked "C" contains a weighing machine capable of weighing any locomotive the company possesses, each and every wheel being weighed separately and at one time.

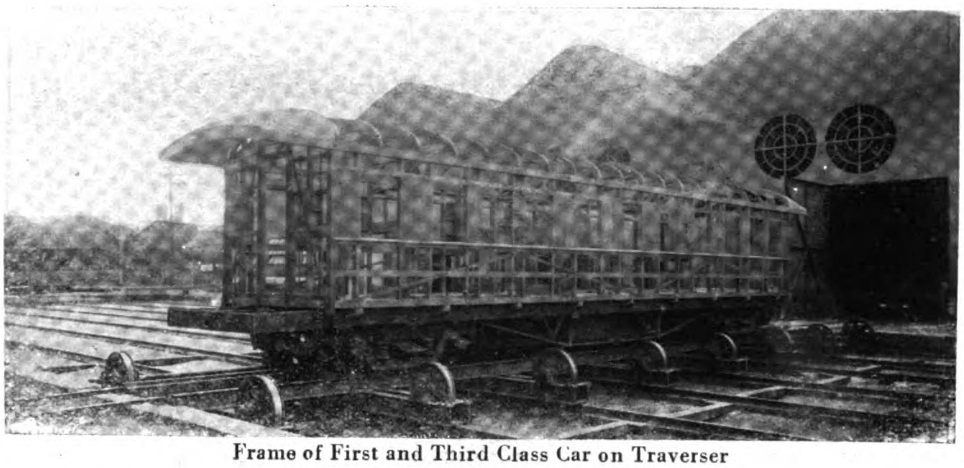
The building marked "D" is the old running shed now used as a wagon building shop, whilst "E" is for coach repairs.

The spaces between "B" and "D" are used for the repair and erection of coach and wagon frames, back track, etc., and are also supplied with compressed air from the main compressor in the machine shop for spray painting, and rivetting.

Communication between the machine and carpenter's shops is supplied by a traverser running the full length of machine and coach repair shops, a distance of 238-ft. long and 60-ft. wide. At the end of this traverser pit, through which it is supplied is the wheel alley marked "F," which contains one 400-ton hydraulic press, one tyre furnace, quenching well, and a small furnace for buffer making. Shower baths for workmen's convenience lie between this alley and carpenter's shops. Water is supplied from two artesian wells, air lift.

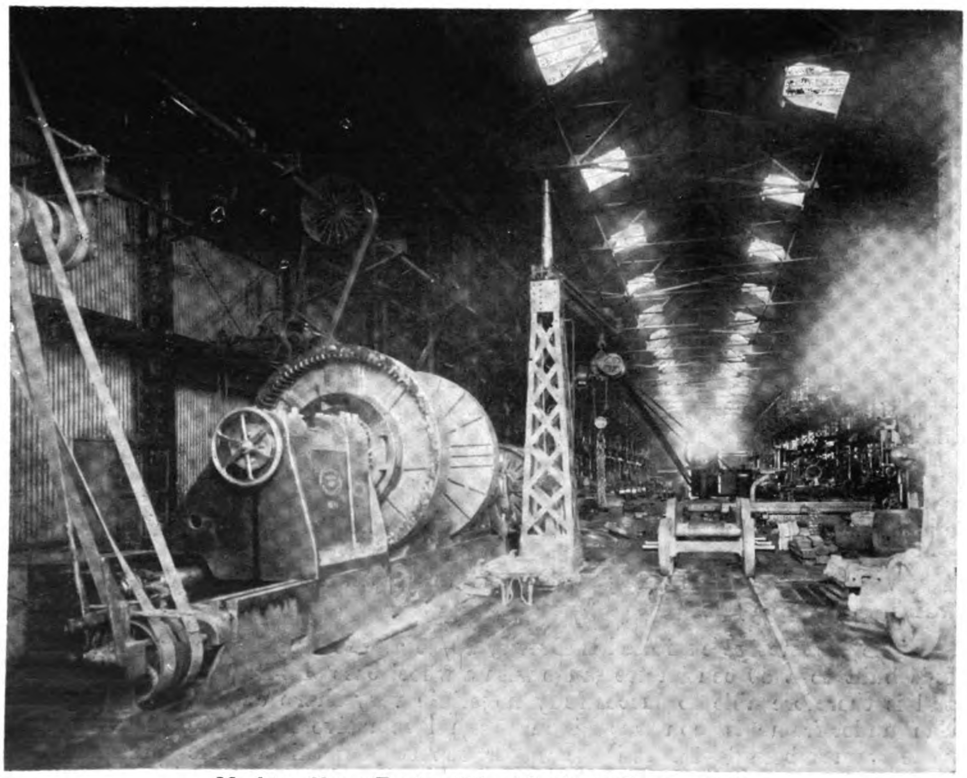
The shops are situated at Caloocan on the main line north, 9 kilometres from Manila and were originally built in 1889, to take care of 30 locomotives and 122 miles of road.

As before stated the machine shops is new, being built in 1913, and enlarged 50 per cent. in 1923.



Frame of First and Third Class Car on Traverser

The shops as they are to-day can easily take care of 10 per cent. of motive power with from 6 to 8 per cent. of rolling stock at one time. This company now possesses 152 locomotives ranging from 16 tons to 127 tons. 192 passenger coaches and 1,952 goods and service stock, whilst total mileage is 657.



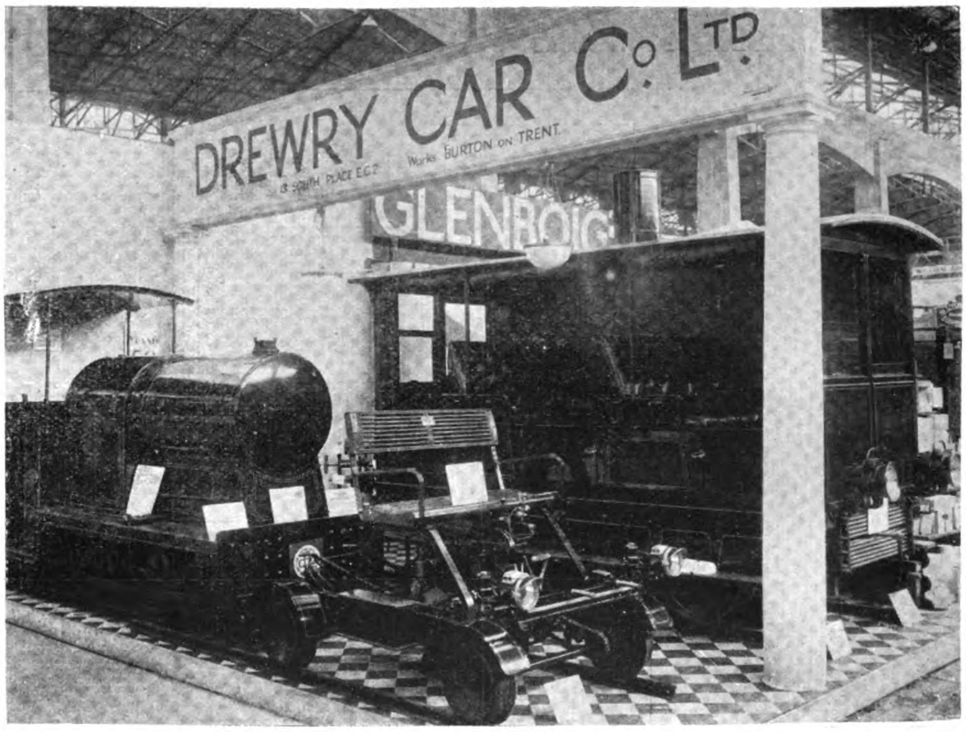
Machine Shop: Engine Wheel Lathe in Foreground

The Drewry Car Exhibit at Wembley

THE rail car exhibited is Drewry standard 20 h.p. type arranged to seat six persons, and is fitted with a four-cylinder engine of 90 m.m. bore by 130 m.m. stroke, which is similar in design and construction to the engines used in Drewry locomotives. A three-speed gear box and reverse gear giving all three speeds in both directions is fitted. The power is transmitted from the gear box by silent chain to the axle. Controls are fitted at each end of the car and it can, therefore, be driven equally well in either direction, the driver always sitting at the leading end.

The newly forged type wheels fitted are 24-in. diameter. Hand brakes are fitted, arranged to operate on both wheels of the axle which is not driven, and in addition there is a foot brake arranged to operate on the countershaft, thus breaking through the driving axle. Tabular radiators are fitted at each end of the car, and water is circulated by means of a rotary pump driven from the engine.

The car is fitted with well upholstered seats having reversible throw-over backs, enablingpassengers to always face in the direction in which the car is traveling. Wind-screens are fitted at both ends of the car. The canopy is supported at each corner by pillars and also by centre stanchions at the sides. Side doors are fitted also side curtains which are rolled up under the roof when not in use and can be made to completely enclose the sides of the car.



If required, electric lighting and self-starter sets can be fitted.

The next exhibit is of Drewry light "Alpha" type inspection trolley. This is fitted wtih a 6 h.p. twin-cylinder air-cooled B. A. S. engine and gear box mounted as a separate unit, so that it can be instantly detached from the chassis. The complete trolley weighs about $5\frac{1}{2}$ cwt. of which the engine and transmission unit weighs 3 cwt. The detachable unit enables the trolley to be very readily and quickly cleared from the track or to be loaded into an ordinary brake van, the seat and power unit being lifted off the chassis after which the chassis itself can be turned up on end and passed through the door of the van. This is a valuable feature and will be particularly appreciated by district and other engineers who have to travel long distances for inspection purposes.

The Drewry Car Co., Ltd. also supply trollies similar in all respects to the "Alpha" type, with the exception that the power unit is not detachable. They can be supplied to suit any gauge and, like the "Alpha," can be fitted with engines varying from 4 h.p. up to 8 h.p. according to the duties and conditions under which they are required to operate.

The locomotive exhibited is Drewry 20/25 h.p. standard type. It is built to a 60 centimetre gauge with a wheel base of 2-ft. 9-in. and is therefore able to successfully negotiate very sharp curves. The under-frame is constructed on steam locomotive lines, the plate frames being $\frac{5}{8}$-in. and the buffer beams $\frac{3}{4}$-in. thick. The driving wheels are of cast steel $1\frac{1}{8}$-in. in diameter, the thickness of the treads being $1\frac{3}{4}$-in. The axles are of steel to main line specification and have journals 3-in. diameter by $5\frac{3}{4}$-in. long. All wheels are coupled and are driven by side rods mounted on outside spur wheels which are driven by pinions keyed to either end of a cross shaft. This shaft is fitted with a bevel reverse gear. The whole of this reverse gear is enclosed in the casing and is thoroughly protected from dust and dirt.

The locomotive can be driven at two speeds by means of Drewry patent duplex clutch and gear box. This transmission is designed for simplicity and especially to eliminate the difficulty in changing speed when climbing a gradient with a load. There are no gears to disengage and re-engage when speed is being changed. The clutches are attached direct to the gears which are in constant mesh, and are operated by a clutch drum which revolves with the engine. To operate the locomotive after the engine is running, all that is necessary is to push the speed lever into the low gear position and, when changing to top speed, to pull it into the top speed position. There is no clutch to disengage before changing gear, only one lever to push or pull as the case may be, the ordinary engine clutch and clutch pedal being entirely dispensed with. The advantage of this form of transmission is that the speed can be changed going up or down an incline without danger of missing, the change being made instantly without shock or loss of momentum, and the locomotive can be successfully operated even by an inexperienced person.

The engine is mounted at the rear end of the frame. This is a four-cylinder engine having a bore of 4-in. and a stroke of 5-in., and develops 20/25 h.p. while the fuel consumption is about $\frac{3}{4}$ of a pint per b.h.p. per hour.

The cylinders are cast in pairs and liberal water jacket space is provided. The valves are of nickel steel, are positively operated and adjustable tappets are provided. Forced lubrication is employed and cooling is effected by means of a rotary pump in conjunction with a large capacity water tank containing 130 gallons of water. Ignition is by means of a high-tension magneto.

The total weight in running order is about 4 tons and locomotives of this type are manufactured by us in sizes ranging from 10 h.p. up to 150 h.p. suitable for any gauge from 2-ft. 0-in. and upwards.

The Drewry Car Co., Ltd., manufacture railway and tramway motor cars from a 4 h.p. light trolley up to main line bogie passenger coaches, and are therefore able to cater for a very wide range of requirements.

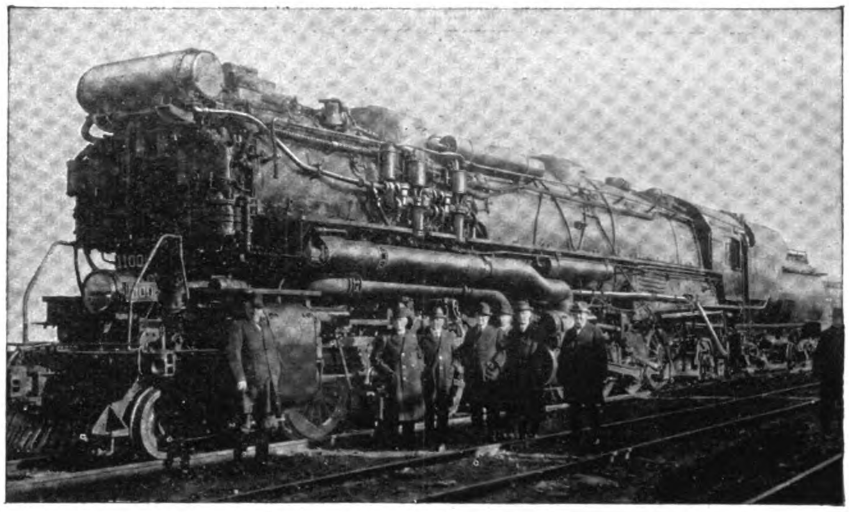
As our readers are no doubt aware, these locomotives, cars and coaches are very well known to railway engineers all over the world, and the company have innumerable testimonials from actual users expressing their satisfaction at the thoroughly reliable service which Drewry cars have given, in many cases over periods of ten years and more.

Preheating Boiler Feed Water with Waste Heat

By John F. Welch

WHILE the descriptive phrase "feed water heaters" may be taken as covering a type of apparatus of comparatively recent application to locomotives, the heating of locomotive boiler feed water has been common practice for a long time. Increasing the temperature of feed water as taken from the tank has been in use on locomotives for nearly three generations and it is doubtful if any locomotive built in the United States during the past thirty years did not have a feed water heater. The device referred to is, of course, the injector.

The first feed water heater (as recognized by the term) was proposed in the United States by Col. S. H. Long, in 1832, and applied to Baltimore and Ohio locomotives, by Ross Winans, about 1836. Very little attention was thereafter paid to it in the United States, where it became virtually a "back number," although it was applied to a considerable extent in Europe, with results than can be conservatively stated as effecting a fuel saving of 12 per cent. or more. It may now be said to be an element of standard European practice, where fifteen thousand are in regular service. From the performance in regular service of the latest design which has been produced in the United States and the trend of public sentiment as to the necessity of fuel economy, there is no room for doubt that it has come back, and back to stay.

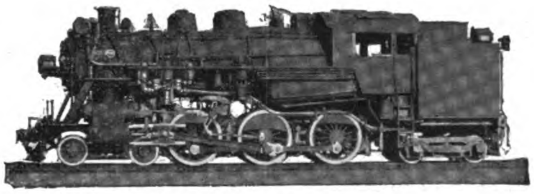


Chesapeake Type Simple Articulated 2—8—8—2 Locomotive Elesco Equipped (Chesapeake and Ohio R.R.)

Mikado Locomotive with Elesco Feed Water Heater

The sole object of the feed water heater is not so much the final temperature that can be obtained, but the reclaiming of waste heat that is now lost at the stack.

Since the locomotive is a prime factor in railway operation the history of its development makes it a materialistic romance and it has no parallel in the records of human achievement nor can too much credit be given the men whose stupendous labors brought into practical form the most potent forces of nature that has ever been subdued for the use of the human race.



Suburban Type Locomotive with Elesco Feed Water Heater

The expensive mistakes in the development of steam engines have, no doubt, caused, to a certain degree, the delay in applying meritorious devices, but now that the committee of the traveling engineers' association on the subject of preheating, has rendered a report to the effect that over one-third of the new locomotives ordered between March 1, 1922, and May 1, 1923, were equipped with feed water heaters, and, in addition, that a number of railroads are applying feed water heaters to their locomotives when they are overhauled, thus clearly indicating that this appliance has attained a high standing among railroad authorities, the adoption thereof will be more rapid and shortly become universal.

Transfer Locomotive with Elesco Feed Water Heater

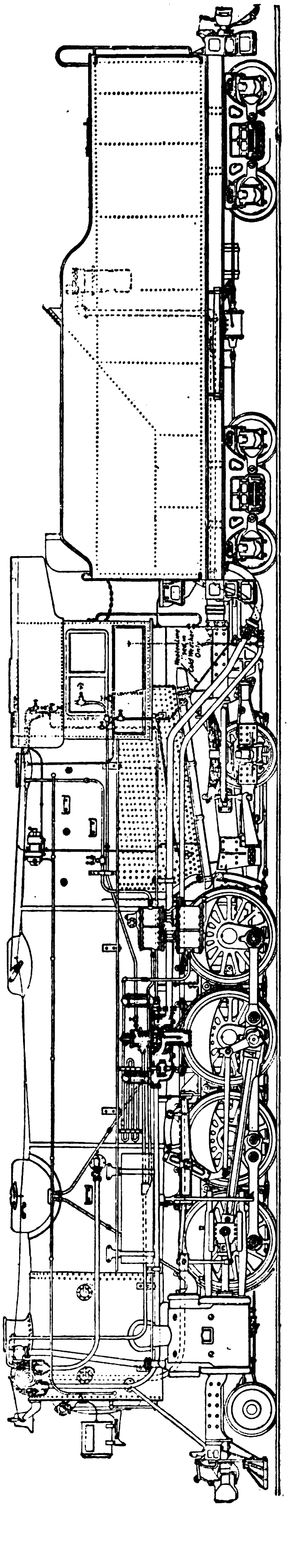
Preheat has been given a vast amount of attention by engineers in the development of same, particularly in respect to *bonâ fide* test covering practically all branches of service, and it does seem, since we can trace back to the year 150 B.C. and find that the people of those times were trying to economically use the power obtained from steam for mechanical purposes, that we of this age would avail ourselves of the opportunities offered, by at least reclaiming wasted heat and using it in preheating.

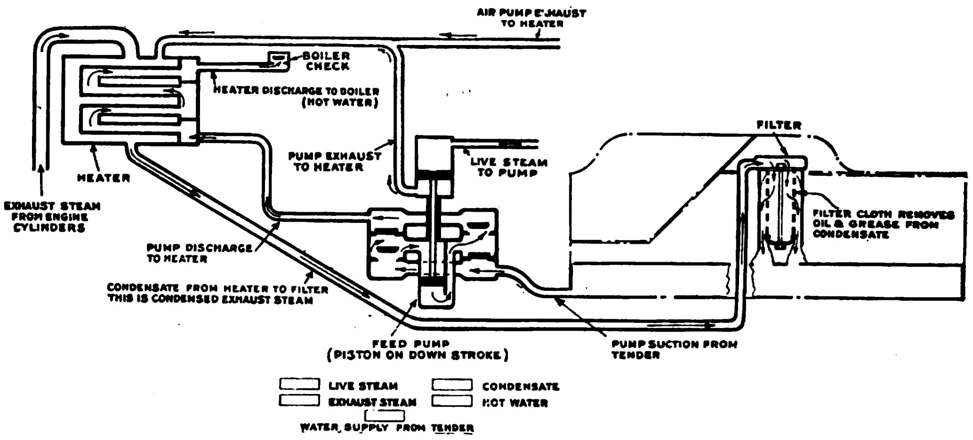
In speaking of economy, it might be well to consider what the application of a feed water heater to a locomotive results in. There as three things: first, it reduces the amount of coal required to produce the required amount of power; second, it increases the available water supply; and third, it reduces the amount of back pressure on the piston, thus making the locomotive earlier in action and more powerful. These gains are all very real and have also been endorsed by the traveling engineers' association.

In a series of test runs made recently and as reported by the railway and locomotive engineering with the conditions of speed, cut-off and steam pressure as near exactly alike as possible, cards were taken and the comparison developed the fact that 3¼ per cent. less steam was required to give a unit of work with the heater than without at a speed of 10 miles an hour, and over 6 per cent. at from 35 to 43 miles an hour.

Engineers in power plants frequently express surprise that locomotives are not generally equipped with feed water heaters. As the locomotive is one of the largest consumers of fuel in the United States, it would appear as if this would be the first place where so well an established and economical practice as feed water heating would be in general use. Whatever the reasons may have been, we are now at last well on the road towards establishing the art of preheating boiler feed water as a standard on American railroads.

In principle, feed water heating is exceedingly simple. A portion of the exhaust steam is led to the heater through which water from the tank is circulated





These drawings serve to illustrate the various passages of steam and water as well as the principle of utilizing waste heat for preheating boiler feed water through the medium of Elesco Feed Water Heaters. The arrows on either drawing indicate the operation of the heater

by means of the pump. Heat from the exhaust steam is transmitted to the water, raising its temperature before passing to the boiler. Therefore, by utilizing heat which would otherwise be wasted at the stack to preheat the boilers feed water, a portion of the work ordinarily performed in the boiler by the combustion of fuel is accomplished. Thus the boiler is relieved of part of its work, and less fuel is consumed for the same steam output of the boiler.

One per cent. of steam economy is obtained from every 11 per cent. increase in feed water temperature. This easily checked and simple rule of thumb is a convenient method of determining the advantages of a feed water heater. The steam used by the feed pump should be deducted from the saving in steam due to the reclamation of heat otherwise wasted.

Any water heating device utilizing exhaust steam effects a reduction in the exhaust pressure against which the engine piston works, or, in other words, produces a condenser action. This reduction in back pressure increases the mean effective pressure and, therefore, the power delivered at the rim of the drivers. It has been found that this increase in power equals or exceeds the power required by the boiler feed pump, and, when properly designed for locomotive boiler feeding, the pump requires not more than 2½ per cent. of the steam used by the cylinders. Frequently, however, the increase in power, resulting from the decrease in back pressure, is as high as 6 per cent., offsetting, with a slight margin, the feed pump steam consumption. Based on the increase in feed water temperature, therefore, the calculation of saving represents a net gain from the use of feed water heaters employing a pump.

Thus a feed water heater is an apparatus designed for the purpose of making practical use of some of the heat discharged in exhaust steam. Its full object is to absorb some of this heat and return it to boiler. This point should be made particularly clear—that the object of the feed water heater is to save heat in exhaust steam that would otherwise be emitted at the stack as waste, and that the hot water coming from the heater is the result of the process and not its object. Of course, the higher the temperature of the water coming from the heater, the greater the saving, but any heating at all by the exhaust steam is a saving of some amount. Note particularly, however, that the water must be heated by heat that will otherwise be wasted, or there will be no saving. The water coming from an injector is hot—sometimes approximating the temperature of that coming from a feed water heater—but that does not mean that a saving has been made, for all live steam injectors of all makes, taking into consideration the variable sizes, etc., use a mean average of approximately 10 per cent. of the steam generated in the boiler. The heat of this steam is returned to the boiler with the exception of the negligible amount lost through radiation between the turret and boiler check; it means, in other words, that the live steam injector is pretty close to 100 per cent., but when the live steam injector is working and using, as we said, approximately 10 per cent. of the steam generated in the boiler, this amount of steam is not available for the engine cylinders, air compressors, stoker, engine booster, or other auxiliaries, as it is completing a cycle from the turret to the injector, to the boiler check, to the turret and so on, means, taking for example a boiler considered 100 per cent. good relative to cylinder horse-power, that as soon as the injector is working and you have a 90 per cent. boiler furnishing steam to the engine and auxiliaries. There is no saving by taking steam directly out of a boiler, putting it into the feed water and discharging the water and steam back into the same boiler.

In order to pick up the largest amount of heat from the exhaust steam, it is necessary to bring the feed water to the heater as cool as possible. It is for this reason that a pump is used with the heater in place of an injector. An injector would heat up the water by live steam and deliver it to the heater at a temperature which would leave little opportunity to reclaim any considerable amount of heat from the exhaust steam. For example, if the water entered the feed water heater at 150 degrees temperature, and exhaust steam could only heat it to 220 degrees temperature, it would reclaim 70 heat units for each pound of water going through the heater. If it came to the heater at 60 degrees temperature and was discharged from the heater at 220 degrees temperature, there is a saving of 160 heat units for each pound of water going into the boiler, or 2¼ times as much as with the higher temperatures.

Understand that when the heat is removed from the exhaust steam in the feed water heater, the same is changed back to water. The water formed in this way is generally referred to as condensate, and is returned to the tender cistern and filtered for further use.

The closed type non-contact feed water heater manufactured by the Superheater company, consists of a pump, a heater and a filter. The pump and heater are located on the locomotive, while the filter is on the tender. The pump is the lighter of the two equipments on the locomotive and is attached to the side of the boiler in a manner similar to the supporting of the air pump. The heater is located on top of the boiler, just ahead of the stack. This is a point where the additional weight is frequently of advantage and the weight of the heater is equalized on both sides of the locomotive.

The pump is the only part of the feed water heater equipment that is a moving piece of machinery. The heater and filter are without moving parts and without wear. Therefore, from the standpoint of reliability and cost of maintenance, the pump is the most interesting and important part by far.

With this in mind, the engineers who developed this heater arranged to use the standard steam end of the Westinghouse locomotive air compressor for the steam end of the water pump. This is of great advantage from a maintenance standpoint, as it provides an equipment thoroughly understood by all roundhouse and shop forces, as well as by the engine crews. It also provides an apparatus which has already been tried out in locomotive service.

Next in importance is the heater. A prime requirement of the feed water heater on locomotives is that is shall give the greatest possible rate of heat transfer between the exhaust steam and feed water heater per square foot of heating surface, accompanied by reasonably low resistance to the passage of the water through the heater. This is necessary in order to get the minimum weight and size of heater. The non-contact type of heater answers these requirements to the very limit of good practice. Careful tests have demonstrated that this type of heater, with corrugated agitators, gives the greatest transfer per square foot of heating surface of any construction that has been presented for test.

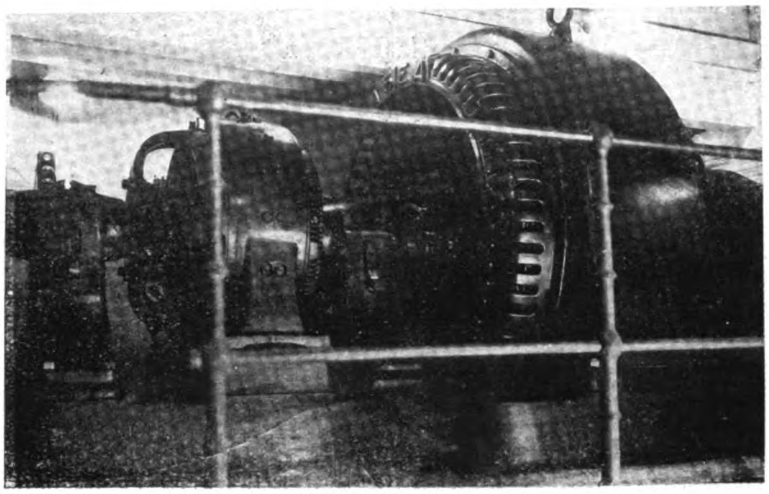
The constructional features of the heater consists of a number of copper tubes, approximately 850-ft., each ⅝-in. outside diameter, which are expanded into thick tube sheets at either end. These tubes are 4 feet or more in length between tube sheets and are arranged in groups so that the water makes the passage of four different lengths of tubes going through the heater, giving it a travel of over 16 feet.

Within each tube is a spirally corrugated agitator made of thin copper stripping. These agitators have stops at one end which overlap and interlock and prevent the agitator from turning in the tube. The water in passing through the tube and around the agitator is constantly impinging against the inner surface of the tubes. This results not only in the high transfer of heat per given area, but also scours the inside of the tube and helps to keep it clean.

Heavy cast iron headers are bolted to the tube plates and are arranged with partitions which compel the water to pass through the four passages in succession. These headers are easily removable for inspection if desired. One of the tube plates is larger than the other and is arranged to be secured to the end of the cast iron body which encloses the whole nest of tubes. The smaller tube sheet is allowed to move freely in a longitudinal direction within the body, and thus provides for the difference between the expansion of the copper tubes and the cast iron shell. This end of the shell is enclosed by a casing to prevent the escape of the exhaust steam around the floating header.

A part of special interest in this heater is the form of joint used for the connection of the tubes and the tube sheets. This joint includes two groups in the tube sheet about midway between the two faces, and as the copper tube is rolled, the metal is cold flowed into these grooves. Experience has shown that this construction is very practical and the likelihood for leaks is reduced to a minimum.

This design of feed water heater equipment has been developed after a number of years of practical experience in locomotive service, and is the result of a most careful study of roundhouse and shop conditions, as well as regular road service.

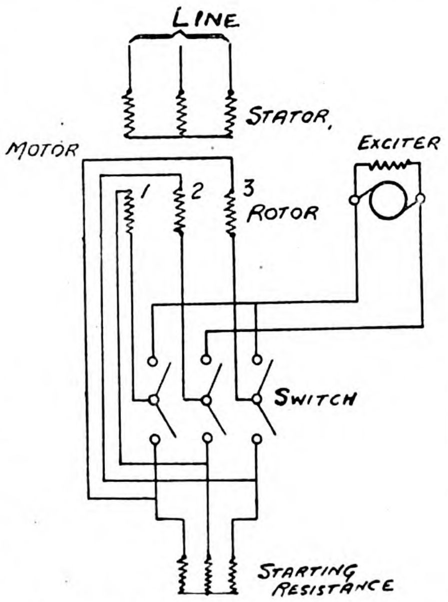


New Type of Electric Motor

A COMPARATIVELY new type of electric motor, known as the austosynchronous motor was installed last year, in the Wah Foong Flour Mill, Shanghai. This machine, manufactured by the G. E. Co. of Sweden, combines the advantages of the synchronous motor with those of the ordinary slip ring type asynchronous (induction) motor. The chief advantage of the synchronous motor is that it can be made to operate at unity power factor, and thus save the extra capacity in cables, transformers, and generating plant which has to be provided to accommodate the wattless current which is caused by the running of ordinary asynchronous motors: but its weak point is its poor starting torque.

The municipal council electricity department, keenly alive to the close relationship between good power factor and economic operation, has offered every encouragement to its consumers through advantageous power rates to improve the power factor of their demand. As a consequence, a number of ordinary synchronous motors are now installed in Shanghai, but with these special arrangement have had to be made so that they could be started up without load owing to their poor starting torque.

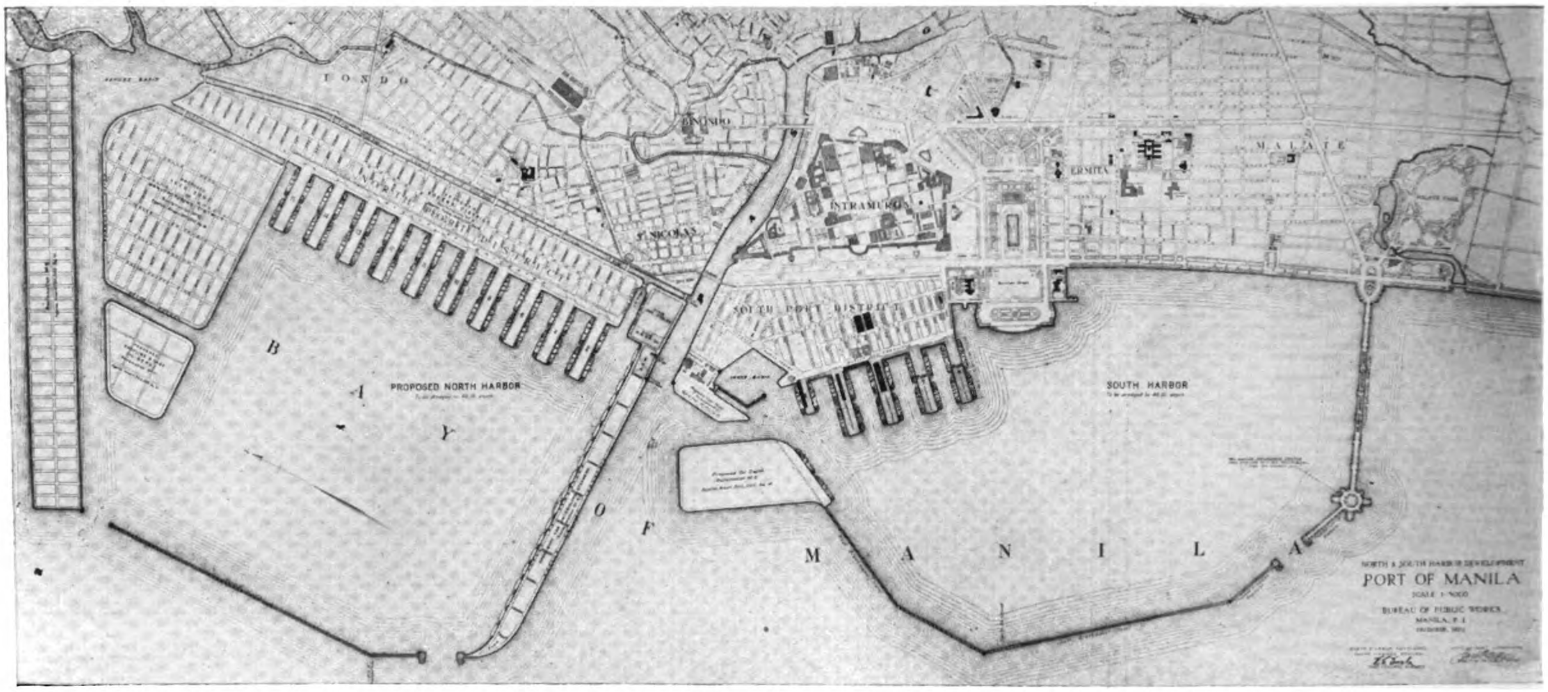
The autosynchronous motor, however, starts up as an asynchronous motor with the resistances inserted in the rotor circuit and can thus start against any load which the ordinary slip ring motor can start up against, and then, on attaining full speed a change-over switch disconnects the resistances and connects the slip ring to an exciter mounted on the shaft of the motor and thus converts the rotor of the motor into a separately exited set of field magnets and the machine is thus converted into a synchronous one and pulls itself into step automatically.



Incidentally it may be mentioned that, if during running such a machine is over-loaded to the point of falling out of step, it automatically runs as an asynchronous motor until the momentary overload is removed when it automatically pulls itself back into step again.

The machine in question is of 400 h.p. running at 300 r.p.m. direct coupled to the main line shaft of the mill and is supplied with power at 6,000 volts. A doubt was felt by some before the motor was put to work as to whether it would start up after an emergency stop with all the stock passing through the mill, but it has been in operation for about 12 months and no such difficulty has been experienced.

We publish herewith a photograph of the machine in question, and also a diagram of connections, showing the change-over switch which converts the machine from an asynchronous one at starting to a synchronous motor during running.



PORT OF MANILA IN 1924

The Port of Manila

Rapidly Progressing as Distributing Centre for U. S. Products

THE port of Manila, centrally situated with reference to the great markets of the Orient, at the head of Manila Bay approximately 30 miles from its entrance and at the mouth of the Pasig River, has to-day a well protected harbor, deep anchorage and well equipped piers and wharves at which the largest vessels plying the Pacific may berth and rapidly discharge or load cargo with up-to-date cargo handling equipment.

The port of Manila is the principal entry port to the commerce of the Philippines; a group of tropical islands of approximately 115,000 square miles of territory, inhabited by 11,000,000 of people. The islands are rich in agricultural lands and produce in large quantities cocoanuts, cocoanut oil, copra, hemp, wood products, lumber and rubber,—all of which is exported.

Annual imports of agricultural machinery, sugar mill and railroad supplies, electrical steam and oil engine equipment as well as practically all products of American manufacture including common food stuff are heavy.

The port of Manila is ideally situated, from a distributing standpoint, to the great markets of the Orient and is rapidly progressing as a distributing and transporting centre for American products. Regular sailing schedules are maintained by lines operating from Manila to Amoy, China; Hongkong; Saigon, Indo-China; Calcutta, India; Madras, Colombo, and Bombay, India; and to Singapore, Strait Settlement, as well as to Javanese ports of Batavia, Sourabaya and Sandakan. A regular service is likewise available between the Australian ports of Sydney, Melbourne and Auckland and Shanghai and Japanese ports.

Manila Harbor

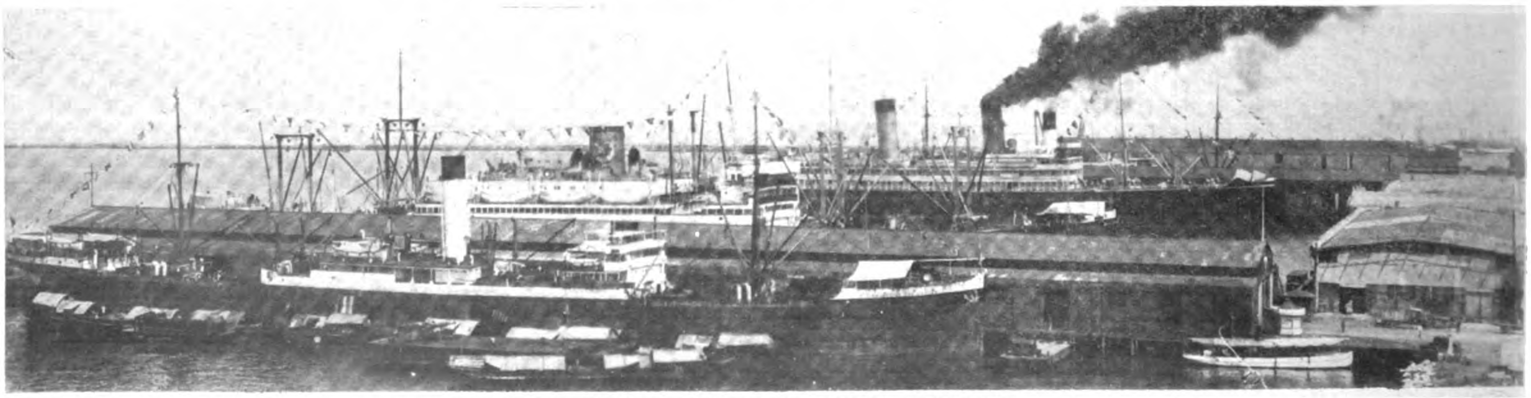
The south harbor consisting of 1,250 acres of anchorage is protected by ten thousand (10,000) feet of rock breakwater wall. Vessels anchoring within this area may load and discharge cargo throughout the entire monsoon season without difficulty and, except for short periods of heavy weather during the passage of a storm, can be safely worked throughout the year.

Pilotage at the port of Manila is optional with the master of the vessel within the harbor. It is compulsory in the Pasig river for vessels over sixty tons gross. Only coastwise vessels enter the river.

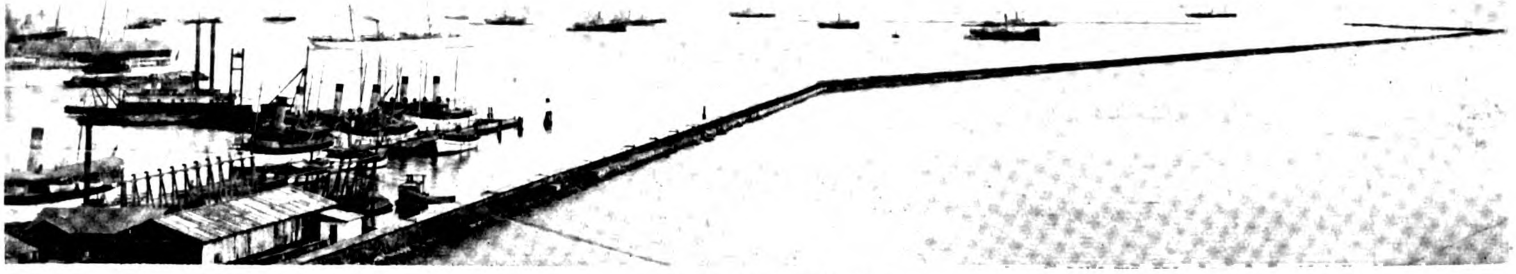
The entrance to the harbor is marked by channel bouys and light beacons. Pilotage service is available to incoming vessels from sunrise to sunset and service may be had for outward bound vessels at all hours.

The average depth of water within the approved anchorage area is 30-ft. zero tide. This depth is maintained by regularly dredging to 32-ft. Preparations are under way for dredging the entire harbor to 40 feet during 1924-1925.

The maximum range of tide is 5.2-ft., or from—1.1-ft. to +4.1-ft. This small range facilitates cargo handling at the pier considerably.



General View of Piers 1, 3 and 5, Port of Manila

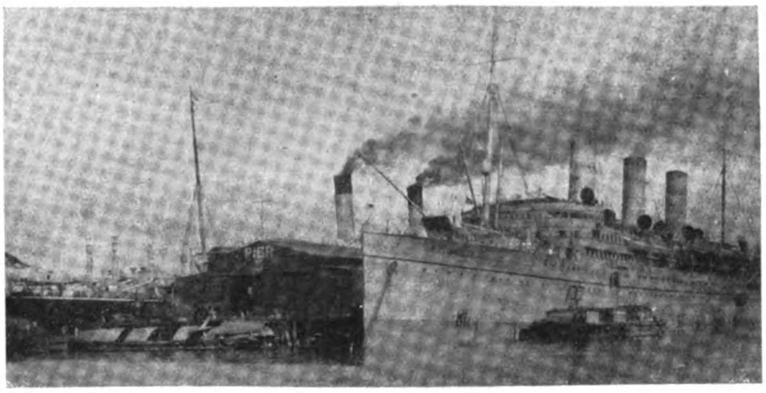


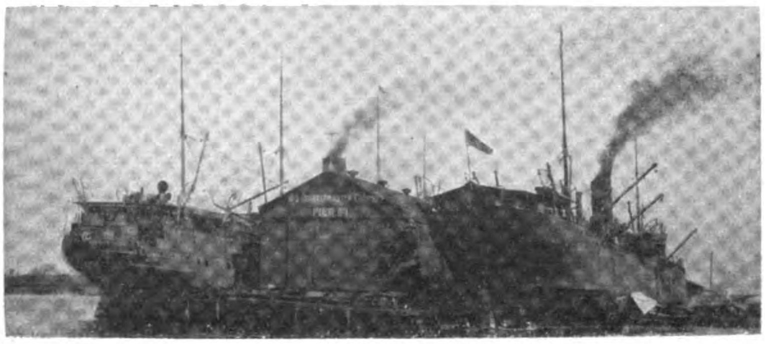
Partial View of Manila Harbor

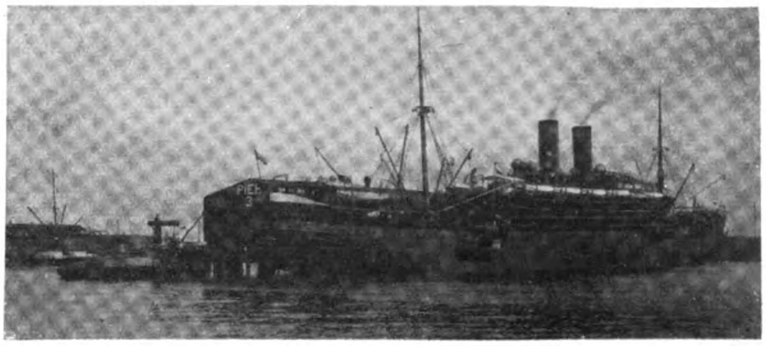
Approximately 7,000-ft. of berthing space is available at the piers and wharves—sufficient to permit the berthing of 9 or 10 large trans-Pacific vessels simultaneously. Additional berths will be made available during the year, with the completion of Pier No. 7 and in 1925 when more wharfage along the bulkhead will be commissioned.

Facilities of the Port

The port of Manila has four government owned piers and bulkhead wharfage available for the accommodation of the overseas trade with sufficient berthage for 9 or 10 large trans-Pacific vessels.







Numerous bonded warehouses provide ample storage space for all classes of cargo at low rates. Several of these warehouses are situated in the immediate vicinity of the piers.

The port is served by an extensive rail system on Luzon and by a number of inter-island steamship lines operating approximately 75 vessels. This service insures prompt distribution of imports and makes the port of Manila the export centre for the country's products.

Fueling Facilities

A large coal bunkering station is maintained by the U. S. Navy at Cavite (¾ hour from anchorage in harbor). Ample facilities are available for coaling vessels in harbor from lighters.

All piers are piped with 10 inch fuel lines for bunkering vessels while at berths loading or discharging cargo. Vessels desiring to take fuel oil from tank lighters may be served by pump barge at the rate of 1,200 barrels per hour.

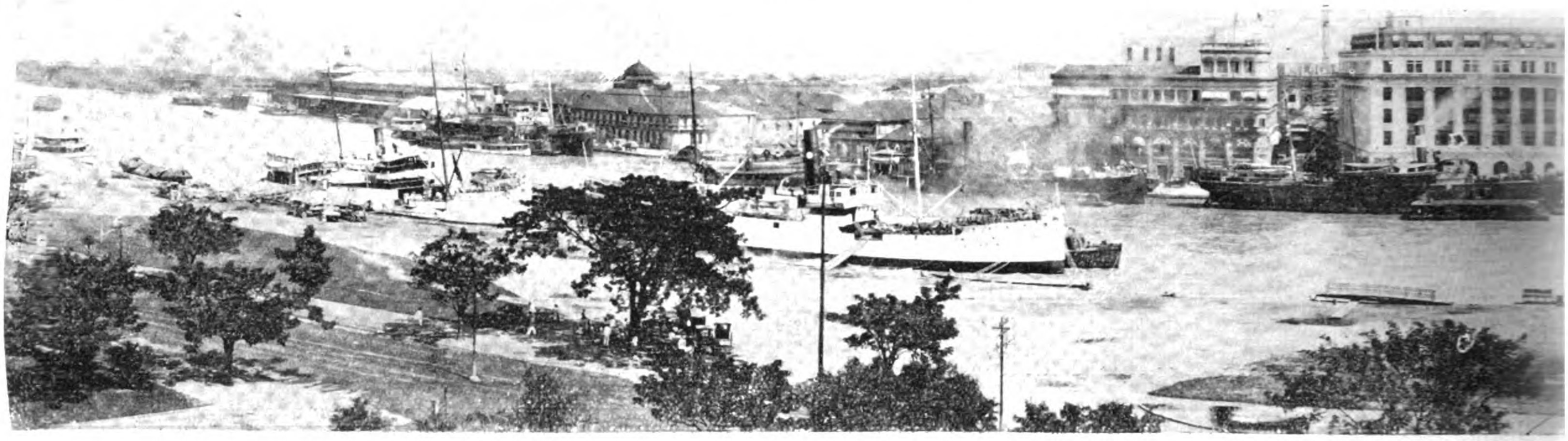
The Standard Oil company, the Asiatic Oil company, the Texas Oil company and the Associated Oil company carry large stocks of fuel oil in bulk and refined oils in case and drum containers. The combined tankage capacity of these

PIER NO. 5

PIER NO. 1 PIER NO. 3

PIER NO. 7

Side View of Pier No. 7 (Less than half the length of the Pier is shown here)



VIEW OF RIVER SHIP

companies and that of the government exceeds three-quarters of a million barrels.

Drydock, Marine Railway and Repair Facilities

The U. S. Navy floating dry dock " Dewey " is available for the repair of any seriously damaged vessels arriving at Manila.

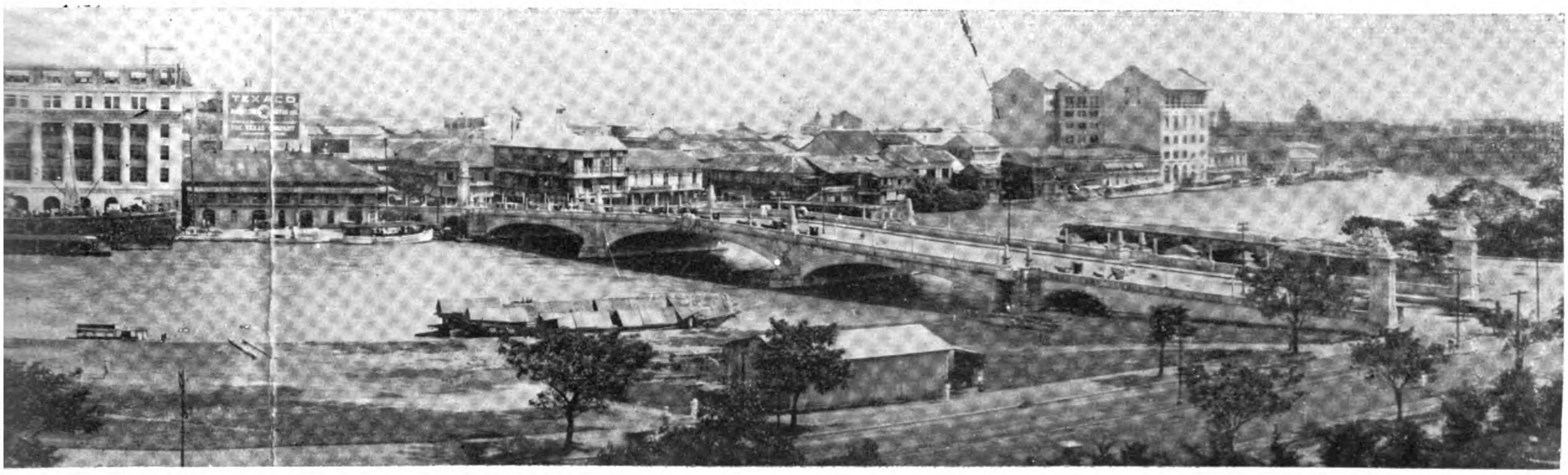
Two privately owned marine railways are operated at Manila for the general repair of vessels under 3,000 tons.

Ordinary repairs may be made aboard ship by a number of machine shops, including The Atlantic Gulf and Pacific Company of Manila, The Earnshaws Slipways and Engineering Company, The Varadero de Manila, The San Nicolas Iron Works and by the repair shops of the bureau of commerce and industry.

Stevedoring at the port of Manila is entirely a private business, and is not under the jurisdiction of the Manila harbor board. The Luzon Stevedoring Company and the firm of Baily and Sidford handle the overseas stevedoring of the port. Stevedoring charges there compare favorably with charges at other ports of the Orient.

General cargo worked from 4 hatches is discharged at the rate of 110 to 150 tons per hour ; coal 100 tons ; case oil 850 cases and lumber 25,000 board feet. Vessels may be discharged or laden continuously for 24 hours per day if desired. The rate of discharge mentioned above can be considerably increased if necessary to turn a ship around within a specified time. The Luzon Stevedoring company recently made a record at Manila in handling 7,800 tons

Aerial View of Port District, Port of Manila



PING, PORT OF MANILA

Photo by Denniston, Inc., Manila, P.I.

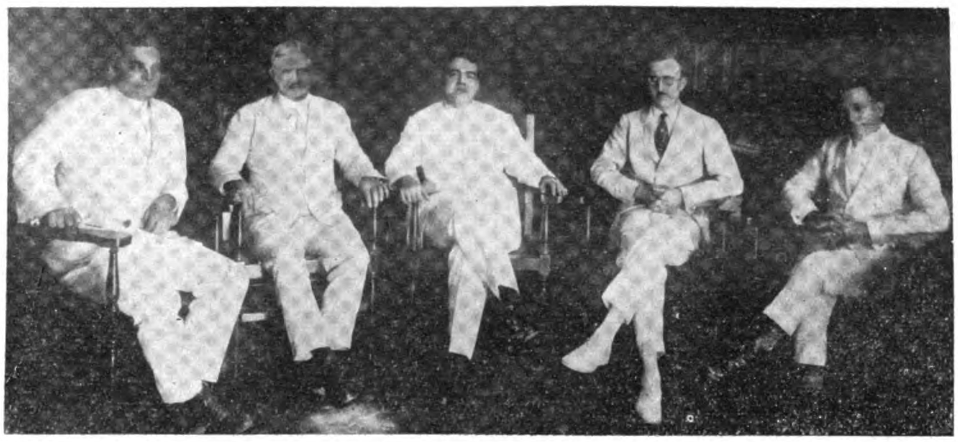
of general cargo aboard one of the "President" type of vessels within a period of 42 hours. A similar record was made in the past year when 23,000 cases of oil was discharged from one vessel in 9 hours.

Sixteen modern exterior semi-portal gantry cranes and 52 interior overhead electric cranes are to be added to the equipment of Manila and will soon be available for further expediting the discharge and loading of vessels there. Half of this interior equipment has just been commissioned.

Heavy Lift Facilities

Heavy lifts up to 20 tons can be handled at the new concrete pier (Pier No. 7) with the semi-portal electric gantry jib cranes which operate over the apron of the pier. Lifts may be discharged from vessels directly on to flat cars or barges.

Ample floating facilities are available for heavy lifts up to 75 tons. There are two 20-ton floating derricks, one 30-ton and one 40-ton floating derricks, privately owned and operated. A 50-ton floating derrick is owned by the insular government, and a 75-ton floating A-frame is maintained by the Philippine division of the United States army. The latter can safely handle 50-ton lifts and with special rigging and management can handle 75 tons. Vessels contemplating the transportation of lifts in excess of 50 tons should communicate with their agents at this port, prior to the acceptance of such cargo, with a view to having special arrangements made for the handling of same upon arrival.



MANILA HARBOR BOARD

Left to right: Mr. A. B. Cresap, Secretary; Col. H. B. McCoy, Vice-Chairman; Mr. Vicente Aldanese, Chairman; Mr. J. F. Marias, Treasurer; Mr. E. C. Earle, Port Works Engineer, Member

Lighterage Facilities

Lighterage at the port of Manila is privately owned and is not under the jurisdiction of the Manila harbor board. There is approximately 40,000 tons of covered and 25,000 tons of open deck lighterage available for general cargo. In addition, about 20,000 tons of lighterage is used for coal handling and when necessary can be used for general cargo. The tonnage is ample to assure adequate service at all times to vessels loading or discharging at Manila

Tank lighterage for about 24,000 barrels of fuel oil is available. A pump-barge, privately owned and operated, handles fuel oil at the rate of 1,200 barrels per hour. Service is continuous 24 hours a day.

Tank lighterage for about 17,000 barrels of cocoanut oil is available. A large pump-barge, privately owned and operated for general public service, handles 1,600 barrels per hour from tank lighters to vessel.

Facilities are available for cleaning tankage preparatory to receiving cocoanut oil and heating coils may be quickly installed by local concerns.

Vessels arriving laden with bulk cargo such as flour, case oil, cement, coal, fertilizers, etc., consigned to companies owning warehouses on the Pasig river, usually anchor in the stream and take advantage of the ship-side delivery permit discharging cargo into covered lighters, cascos or upon open barges. A large proportion of the exports of the port are moved directly from warehouse to ship by lighters.

Federal Terminal

Pier No. 1 is 550-ft. long and 60-ft. wide, covered with a transit shed 500-ft. by 52-ft. Piped for fresh water and bunker fuel oil.

Equipment: Hand trucks; flat cars; electric industrial trucks; tractors and trailers.

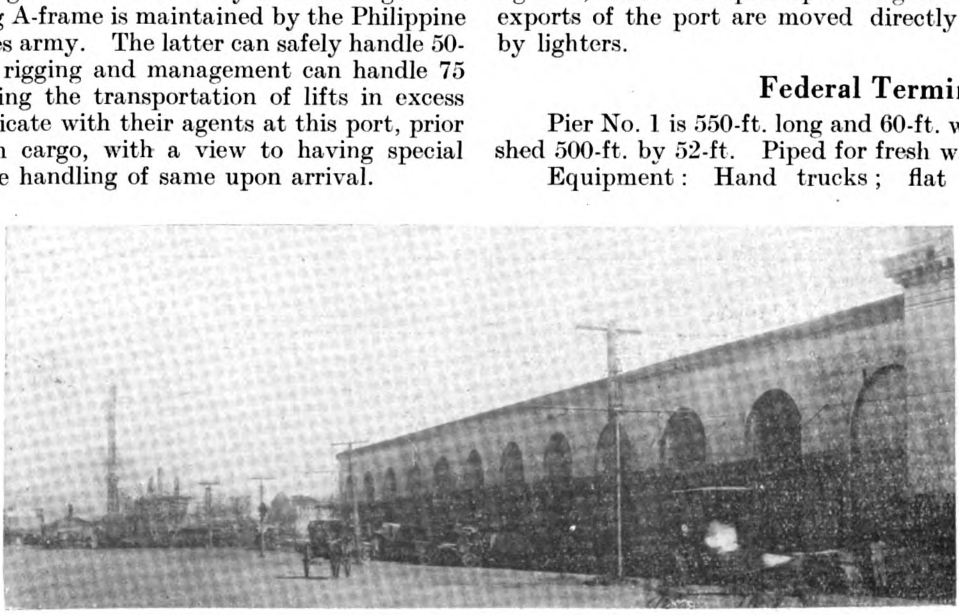
Water: Thirty feet at zero tide.

Operation: Owned and operated by U. S. Government for use of army and navy.

Wharf A is an open wharf 350-ft. long.

Water: Eighteen feet at zero tide.

Operation: Owned and operated by U.S. government for use of army and navy.



Partial View of Cargo Sheds, Port of Manila

Insular Terminals Publicly Operated

Pier No. 3 is 670 feet long and 70-ft. wide, covered with a transit shed 550-ft. by 60-ft. Piped for fresh water and bunker fuel oil.

Equipment: Hand trucks; flat cars; overhead traveling electric cargo hoists; electric industrial trucks, tractors and trailers.

Water: Thirty feet at zero tide.

Operation: Publicly owned and operated under contract by Manila Terminal company under supervision of the Manila harbor board.

Pier No. 5 is 720-ft. long and 110-ft. wide, covered with a transit shed 600-ft. by 100-ft. Piped for fresh water and bunker fuel oil.

Equipment: Hand trucks; flat cars; overhead traveling electric industrial trucks, tractors and trailers.

Water: Thirty feet at zero tide.

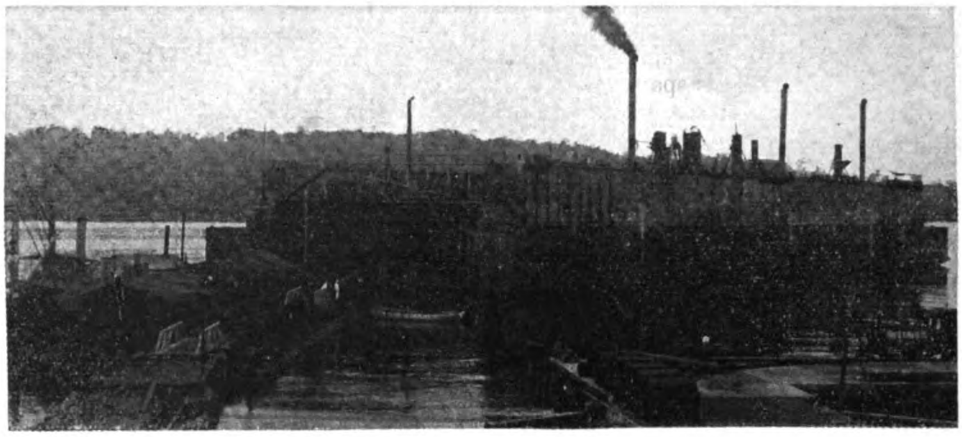
Operation: Publicly owned and operated under contract by Manila Terminal Company under supervision of the Manila harbor board.

Pier No. 7 is to be 1,400-ft. long (700-ft. now completed and in commission) and is 240-ft. wide, covered with a transit shed 1,253-ft. by 160-ft. Piped for fresh water and bunker fuel oil.

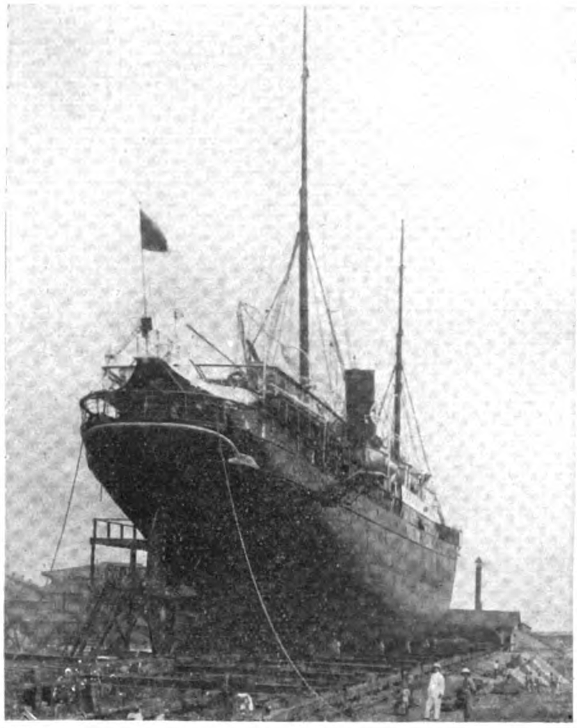
Equipment: Hand trucks; flat mechanical stackers and conveyors; 15-ton exterior electric semi-portal gantry cranes; 50-ton locomotive cranes; 3½-ton interior overhead electric cranes; electrical industrial tracks, tractors and trailers.

Water: Thirty-five at zero tide.

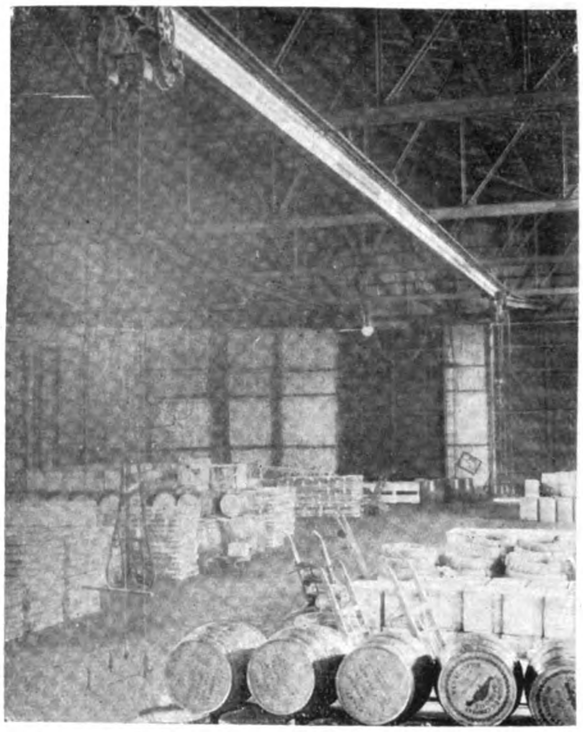
Operation: Publicly owned and operated under contract by the Manila Terminal company under supervision of the Manila harbor board.



Drydock "Dewey" at Olongapo



Earnshaw's Docks & Honolulu Iron Works Marine Railway, Port of Manila



Interior View, Pier No. 5, Showing Overhead Traveling Cargo Handling Hoist

Bonded Warehouses, Port of Manila

Fuel Oil Facilities, Port of Manila

New Modern Terminal Structure Opened

The recent commissioning of a portion of the ports' newest and most modern terminal structure, Pier No. 7, marks an epoch of great importance in the development of the ports' harbor improvement program which has for its objective the making of Manila "The Trade Centre of the Pacific." The new structure is one of the finest of its kind in the Pacific Ocean and will have berthing capacity sufficient to accommodate four of the largest type of vessels plying the Pacific such as the *Empress of Canada* and the President steamers. The structure is 240-ft. wide and when completed will be 1,400-ft. in length. Its cargo capacity will exceed that of the largest pier at this port (Pier No. 5) by about six times. The structure is provided with the most improved and up-to-date type of cargo handling equipment, second to none, which will enable ships to clear in practically two-thirds of the time now required. The equipment consists of large exterior semi-portal Gantry electric cranes for removing the cargo from the ship's hold to the apron of the pier; to waiting cars or to the platform of industrial trucks, etc., and *vice-versâ*. Within the transit shed there has been installed a flexible system of overhead electric rapid hoisting and stacking cranes which are capable of moving both longitudinally and laterally. Industrial

trucks, tractor and trailers are used to rapidly relieve the apron of its freight. Additional to the equipment and facilities above mentioned, the pier will have ample waiting room space and other conveniences for the use of passengers as well as space in the pier head for the use of customs officials engaged in the examination of baggage including offices. A large and convenient baggage room, has also been provided. A novel feature of the new pier is the overhead passenger passageway which runs along the outer edges of the transit shed at the second level. The use of this passageway is to enable passengers to reach the ship's deck without the necessity of passing through the more or less dangerous areas utilized for the loading, unloading and storage of freight. Ships' decks are reached by ascending the stairs on either side of the waiting room in the pier head or by using the elevators situated adjacent to the baggage room, and thence by passing through the overhead passageway to a movable bridge connecting the passageway with the deck of vessel. Rail connections will link the new terminal structure (Pier No. 7) up with all points on the Manila Railroad Company lines and with local warehouses.

Wharf " B " is 750 feet long and 100 feet wide, covered with a transit shed 750 feet by 85 feet. Piped oil.

Equipment : Hand trucks ; electric industrial trucks, tractors and trailers.

Water : Twenty-two feet at zero tide.

Operation : Publicly owned and operated under contract by the Manila Terminal Company under the supervision of the Manila harbor board.

Following is the report of the harbor board :—

June 1, 1923.

To His Excellency,
THE GOVERNOR GENERAL,
Manila, P. I.

SIR,—The Manila harbor board, created by Act No. 3002 of the Philippine legislature, has the honor to submit the following report of its operation for one year from June 1, 1922 to May 31, 1923 :

Organization of the Board

The board was organized March 7, 1922, as heretofore reported, and has held twenty-five meetings. The board consists of the following members :—

Mr. V. Aldanese, chairman
Col. H. B. McCoy, vice-chairman
Mr. A. B. Cresap, secretary
Mr. F. J. Marias, treasurer
Mr. E. C. Earle, member

Method of Operation

Pursuant to the provisions of Section 13 of Act No. 3002, the board, on May 31, 1922, entered into a two-year contract with the Manila Terminal Company, Inc., a local corporation, for the receiving, handling, custody and delivery of all merchandise, imported or exported, over the piers and wharf at the port of Manila.

The Manila Terminal Company, Inc., began operations under the terms of their contract on June 1, 1922, since which time, necessary regulations have been issued by the board, and accepted by the contractor, modifying somewhat the original provisions of the contract.

Limits of Authority of Board

Under the provisions of Act No. 3002, the Manila harbor board is limited in its activities solely to the general supervision, control and regulation of the receiving, handling, custody, and delivery of merchandise on the piers and wharf at the port of Manila, and to the fixing of the charges therefor.

Supervision of Work of the Manila Terminal Co., Inc.

The supervision and inspection by the board of the work of the Manila Terminal Company, Inc., has been continuous as to its activities ; and the manner of handling merchandise, preventing congestion, keeping piers and wharves clean and accounting for its income. The result of the work accomplished by them, has exceeded all expectations in every way.

Results of Board Work

Quicker dispatch in handling cargo onto and off the piers ; accurate checking of all cargo handled ; a reduction of short landed cargo to an almost negligible quantity, the prompt report of bad order cargo which is now given special care in handling ; the prompt settlement of claims for cargo damaged in handling ; the keeping of the piers and wharves clean, and the elimination of congestion on the same.

These matters have all been handled promptly and to the satisfaction of all concerned, shippers, shipping companies, customs authorities and the public. All claims made have been settled promptly and equitably.

New Equipment

The board has ordered ten (10) new electric one-ton hoists, similar to those now in use on Piers Nos. 3 and 5, to supplement same in order to expedite the handling of cargo during periods when congestion occurs, as has happened several times during the year, and also to provide for depreciation and replacement of hoists which have been in constant operation for some years. These hoists will cost approximately P.26,000.

Vessels Using Piers

During the period covered by this report, eight hundred and ninety-three vessels arrived at Manila from foreign ports. Of this number, four hundred and eighty-six, or about 54 per cent., used the piers ; while seventy-two coastwise vessels used the piers during the year.

Cargo Handled

The Manila Terminal company handled 340,964 tons import cargo and 20,911 tons export cargo or a total of 361,875 tons of cargo of which shipside delivery was granted 150,150 tons and there were handled over the piers 211,725 tons.

The above figures excluded coal, liquid fuel oil and lumber which are not handled by the Terminal company.

Very respectfully,
VICENTE ALDANESE,
Manager.

Tin Mining in the F.M.S.—II

(Continued from page 609).

other, in the centre of the mine It is stated that on the north side of the gut, the pay-dirt is only 10 feet broad, and runs along the shale and quartzite face. In the gut there is said to be no *karang* at all. On the south of the gut the *karang* is wider. In the gut a mass of quartz and kaolin-rock is intrusive into the limestone. It contains patches of tourmaline and some big quartz-veins with white mica.

In the Tronoh South Mine the pay-dirt follows the junction of the shales and limestone.

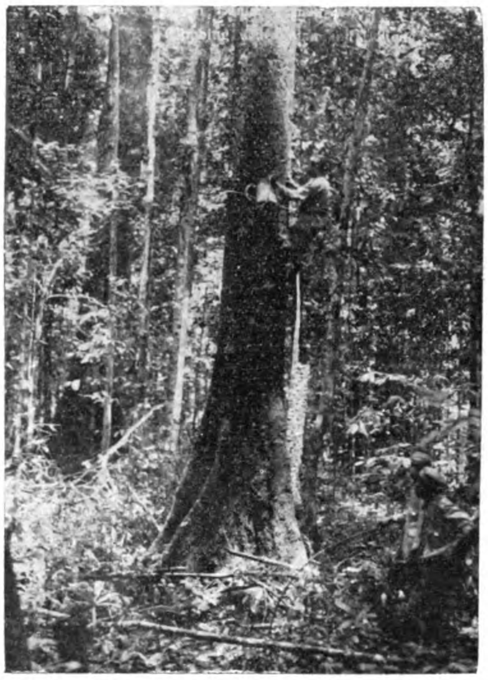
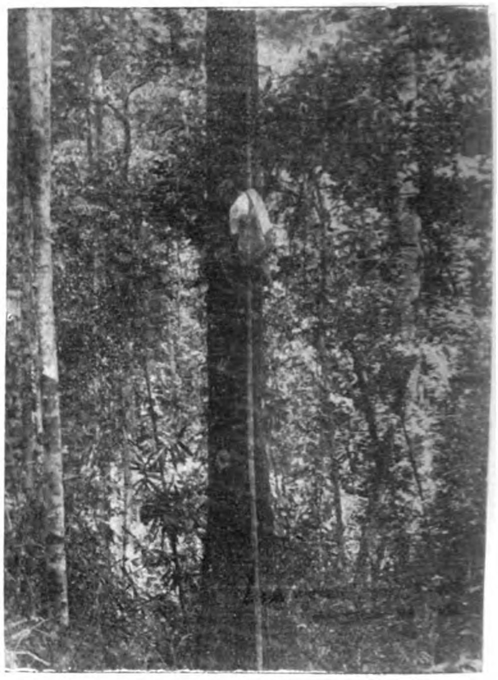
Fig. 22 is an idealized section of the Tronoh, Ltd., Mine, looking north. It will be seen that the Gondwana clays are represented as continuing up the face of the reversed fault. This is in accordance with information received ; but there is no doubt that near the surface worn alluvial ore was found, which gave place in depth to the angular ore in the clay.

Ulu Piah

The mine worked by the Ulu Piah Co., Ltd., is situated in a corner of the hills near Ampang with limestone cliffs on one side and granite on the other. Over the limestone bed-rock of the mine is stanniferous clay with boulders.

Scheelite in quantities worth exporting has been found in this mine, associated with colorless flourite. There is little doubt that it occurs in the limestone *in situ*, and in 1914 a vein was seen composed of flourite and scheelite, and the appearance of the fluorite led to collecting a quantity in order to utilize it for the production of hydrofluoric acid when supplies seemed uncertain. It was found, however, that it contained both silica and boron in sufficient amounts to make it useless for this purpose. The boron was present, it is believed, as a constituent of axinite.

In April, 1915, a contact between the limestone and white non-porphyritic granite was exposed in this mine. In the granite were veins of purple axinite and green epidote and at the contact was a band of rock about 3 inches thick, 2 or 2½ inches of which on the granite-side consisted of fine-grained pink garnet, while the remainder, next the limestone, was a pale-green idocrase.

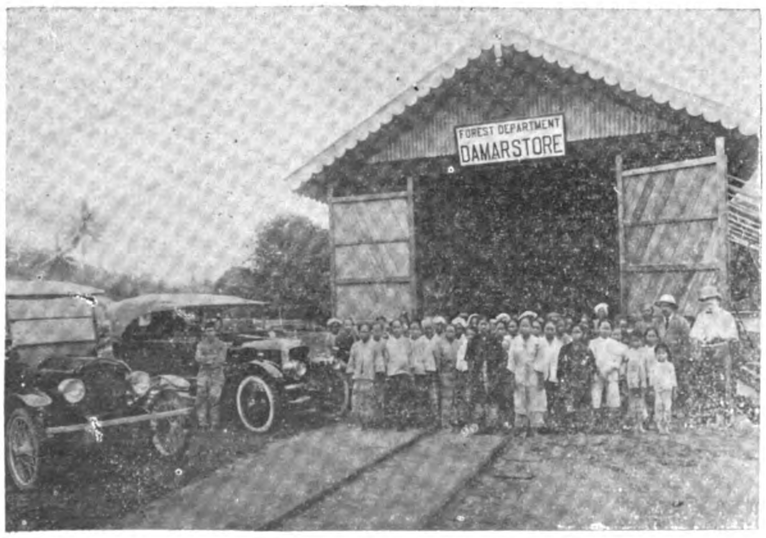
Gathering Damar Penak in the Forest of Malaya

The Damar Industry In the F.M.S.

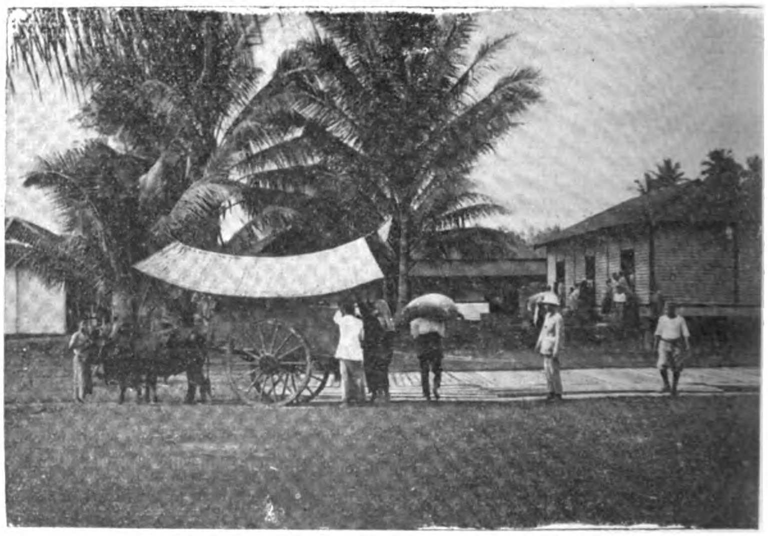
IN his annual report on forest administration for the year 1923 the conservator of forests (Mr. E. Cubitt) says that the departmental working of *damar penak* (or *damar chengal*) has now been thoroughly established in Negri Sembilan, but progress in the other states is disappointing owing to the almost entire lack of suitable labor. Even in Negri Sembilan the output is far below what was expected, but lack of quantity is made up for by excellence of quality.

The grades adopted by the department were quickly established, and sales are now made to Europe and America f.o.b. Singapore without samples, buyers being satisfied with the signed guarantee placed in each case. It is stated that the Singapore dealers are now copying the methods of the forest department, and a departmental trade-mark is about to be registered. To prevent all possibility in the early stages of the industry of any variation in quality it has been decided that all grading for export shall be done at Kuala Pilah, even though this may be rather more expensive than grading locally; local grading would necessitate a form of guarantee, and possibly a separate trade-mark for each state, which would at once invite comparison of qualities and encourage buyers to discover (or invent) reasons for lowering prices. The market now seems secure, and the outturn at present is not large enough to be split up.

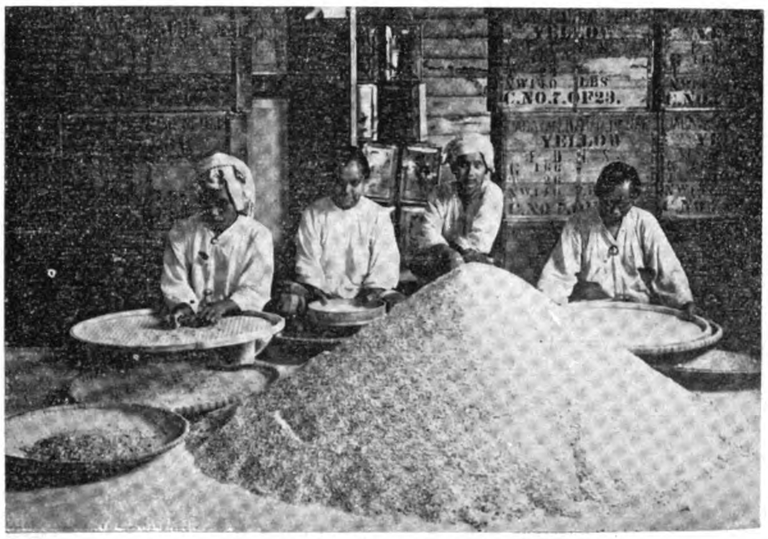
Negri Sembilan had the initial advantage of an efficient, if somewhat inadequate, labor force accustomed to the work of damar tapping and brought up to climb to the branches of the largest trees, from which the best quality of damar is obtainable. This force has now been supplemented by immigrants from the Dutch Indies, fifty families of whom have been settled at Langkap under their own "raja." A small area of padi and kampong land, which may not be sold to others, is given to each settler, and $1 (2s. 4d.) is paid for each *penak* tree brought into full bearing. More than 1,000 trees have already been tapped by them, and will soon be a permanent source of income. The results of the year's work in Negri Sembilan are an indication of the possibilities of this newly-organized industry. The outturn of graded damar (including a small quantity of *damar mata-kuching*) was 125 piculs (over 7 tons) a month, including 21 piculs (1¼ tons) from Perak and Pahang.



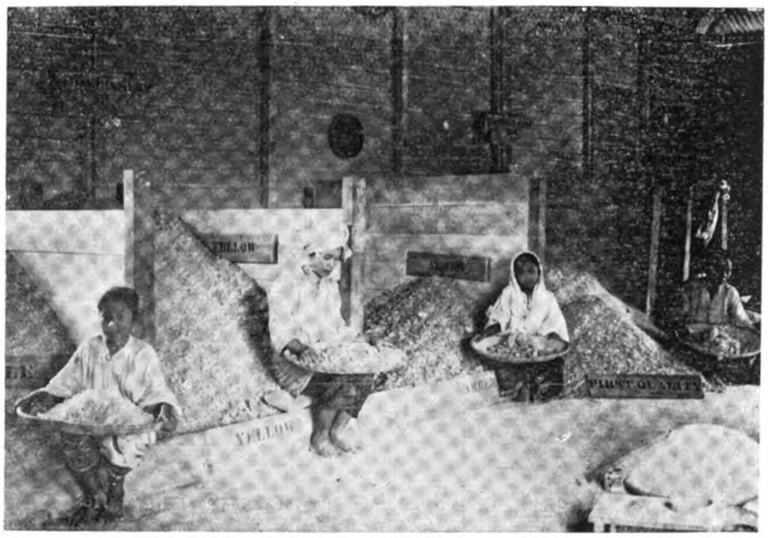
Damar Store at Kuala Pilah



Damar Collecting Station at Kuala Pilah



Grading Damar Penak



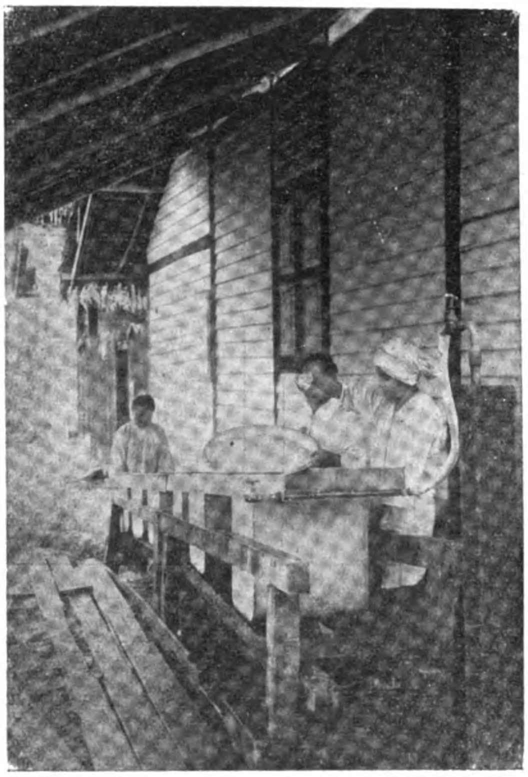
Various Grades of Damar Penak

Varieties of Damars

Certain of the damars were further investigated by the chemists of the agricultural department, and the results show that there is little difference in chemical composition between the different commercial grades of *damar penak*, though the darker grades give a darker solution and are therefore less valuable. *Damar penak* dust, when melted and freed from impurities, solidified into a very dark mass for reasons which are obscure, and it is still hoped to discover a satisfactory treatment. Other damars examined by the agricultural department were *damar mata-kuching* and *damar siput*.

It is recorded that the industry of damar collecting in the Malay States is still in a very primitive state, although a great improvement has been made during the past two years. In time it is hoped to extend the departmental working to more of the damar producing areas of the Malay peninsula. At present the forest department can undertake to supply some 70 tons of carefully cleaned *damar penak* a year, and it is hoped that the outturn may be considerably increased within the next few years.

A writer in the *Malay Mail* gives the following description of the damar industry in Malaya. The industry, he says, consists in the tapping of the *chengal* tree, though the word "tapping" does not convey an adequate idea of the means employed for getting the *damar*—the Malay word for resin—from the tree. What is actually done is to make deep cuts on the tree right up to the hard wood, which are about a span long and four or five inches wide, and to keep renewing these cuts until the yield of damar, both in quality and quantity, is considered satisfactory. There are many kinds of damar to be found in the forests of Malaya, but the most valuable and the one which fetches the highest price in the markets of the world is the Malayan *damar penak*.



Washing Damar

The Industry To-day

The industry, which is controlled by government through the forest department, is now well organized, and provides a large number of Malays throughout the peninsula with a handsome income, the size of which depends almost entirely on the individual enterprise and zeal displayed by the Malays themselves. The main reason why government took over the control of the industry is pos-

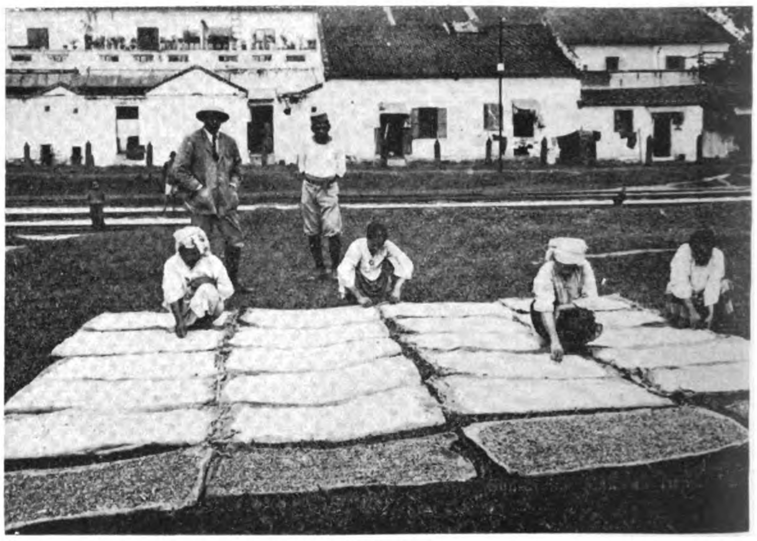
Sorting Damar at Collecting Station

sibly because it was anxious to preserve it as a purely Malayan one, so that the Malays might be persuaded to remain in their kampongs without roaming about the country. The industry may be said to have been established in Negri Sembilan, Johore, Pahang, and Perak, where the collection of *damar* is steadily proceeding. Every encouragement is given to the Malays to tap trees and to collect the *damar*, and the results have not been altogether disappointing, except possibly in some parts of Perak. The working of the new system is in full swing, in Negri Sembilan, in the Kuala Pilah district, and it may be briefly described as follows :—Certain forest reserves and state land areas have been thrown open to Malays and Sakais who wish to tap *penak* trees, on the condition that they sell their produce to the forest department. Each man is given a certain number of trees, not fewer than twenty, and if he taps them regularly and collects the *damar* with care and assiduity he is allowed to retain the first claim upon them. Trees are tapped at intervals of about three months. As they do not yield fully until the 3rd or 4th operation the tapper is paid for this work. When he has tapped all his trees and brought them all to full maturity, which is a long and laborious process, he has to collect his *damar* and take it to the nearest receiving station, which is not far from the *penak* zones, of which there are no fewer than seven in the Kuala Pilah district. Here a forest guard receives the *damar*, weighs it, and pays cash then and there to the Malay, the rates differing according to the quality of the *damar* which is brought. The collectors are rigorously discouraged from collecting immature *damar*, *i.e.*, such as has not hardened. These cash transactions, which enable the Malay to go to the cheapest shop in the district for his necessities, from one of the most attractive features of the system adopted by the forest department. The forest guards are supplied with cash, and have to keep regular accounts of all the *damar* purchased and the amount paid out, and these accounts are regularly checked by the district forest officer at Kuala Pilah, who is supplied with funds to replenish the coffers of the receiving stations when they are exhausted. From the receiving stations the *damar* is conveyed to the central store at Kuala Pilah, where Malay and Chinese women sort the product into its various grades. This sorting requires a good eye and skill. The

Sakai Women at a Damar Collecting Station

value of *damar* depends largely on its color, the paler kind fetching a much better price than the darker qualities. Being used largely in the manufacture of white enamel paints whiteness—or rather absence of colour—is essential. Color darkers the paint. In addition to the color, which affects the value of the *damar*, the store officers have to see that the lower grades of the products are free from chips of wood and bark. A suggestion was made that the *damar* dust which contains these foreign substances should be washed, and Mr. Kinsey. the deputy conservator of forests, Negri Sembilan, devised a washer which is achieving the object admirably, although it cannot be said to be perfect.

Government Officials Buying Damar from the Sakai



Sun-drying Malayan Damar

It is capable of improvement, and in course of time it may be possible to market a dust free from the minute black foreign matter which disfigures it at present. At the store the *damar* is packed in strong wooden boxes made to contain 140-lbs. in each, and carefully fastened with iron hoops, and then despatched to Singapore to Messrs. Stephens, Paul & Co. Every box despatched from the store contains a printed guarantee signed by the district forest officer, that the *damar* is of a certain quality, and this guarantee goes with the box to its destination. What happens there it is impossible to say, and the greatest efforts are now being made to see whether the *damar* cannot be sold direct to the manufacturers who, it is suspected, are not always getting Malayan *damar penak*, but a mixture of this with other varieties. There is considerable danger to the industry from that quarter, which will have to be combated.

Malayan Damar Penak

At Pertang, about twenty miles east of Kuala Pilah, not very far from the Pahang boundary, there is a large forest reserve where the forest department is carrying out experimental tapping on 102 trees. The *penak* tree is easily distinguishable by its huge girth, and by its long and erect trunk, which sometimes rises to forty or fifty feet from the ground before branching out. In the sample plot each of these trees is given a number on a metal disc which is planted on the foot path traversing the forest, and a careful record is being kept of the methods of tapping employed and the

extent of the yields secured by each method. A study of these results will become necessary as the industry advances.

A glance at the tree is sufficient to give one an idea of the task which confronts the climber searching for *damar*. At present *damar* collectors are not allowed to tap *penak* trees of less than six feet girth, obviously because it is surmised that trees of a lesser size do not yield either a sufficient or a good quality of *damar*. Two ways of tapping and three ways of climbing the tree are now in vogue. The two methods of tapping are :

(1) Basal or bole tapping.
(2) Branch tapping.

In basal tapping the cuts are made on the trunk, beginning about six feet from the ground and working upwards, the total number of cuts thus made on an average sized tree being about 48. They are made all round the trunk equi-distant from each other. Branch tapping explains itself. It is the more risky method, but the more popular one with the Malays. It is hazardous enough to climb the trunk and remain there until the cuts are made, but to climb the trunk and tap the branches is positively dangerous even for those who are adepts at the art of climbing. It is, however, noteworthy that the Malays prefer branch tapping because by long experience they find that from the branches they are able to gather a better and larger yield of *damar* than from the trunk.

The Tapping

Once the difficulty of climbing the tree is got over the actual tapping does not present any great problem. Whether the instrument used is an ordinary *parang* or the *biliong* the method of cutting off the bark exposing the sapwood is practically the same. The cuts are more or less deep gashes, concave above and convex below. This hollowness of the cuts prevents the exudation from the tree from falling to the ground. In the branches, when such cuts are made, the *damar* forms into a kind of stalactites. About a month or more after the first tapping the blazes have to be reopened, and sometimes later the cut has to be cleaned up once again. In fact the first results are not available in less than three months. This, at present, is supposed to be the yielding period of the *penak* tree. After the first three months the yield is not very great, but it increases with each tap until it might be from 40 to 50 katis per tree. It is not yet possible to say with any degree of certainty at what stage the tree yields its highest, but experiments are being carried out to this end. It might be asked how the tappers could maintain themselves if they have to work only once in three months. The system adopted by the forest department is roughly as follows: In the Kuala Pilah district, which I have seen, the tappers live in their own kampongs, and the *penak* trees which are given over to them for tapping are not far from their houses. If we take a man who has been given twenty trees to tap we find that he does not tap all of them at once. He distributes the work evenly over three months. That means he will tap ten trees in the first month, ten in the next month, in addition to cleaning up the cuts which he had made during the previous month, and ten in the third month. By the time the last ten trees are tapped the first ten would be producing *damar*, and in the sixth month all his twenty trees would be producing, the first ten probably much more than the last ten. In about twelve months all his trees would be in full bearing, but it would not take more than say half a month to collect the *damar* from all these trees. Thus he has a sure income of about twenty dollars per month, while he has fifteen days at his disposal to devote to his other agricultural pursuits, from which he can make something extra if he is enterprising enough.

Collection of the Damar

Now we come to the *damar* proper. *Damar* exudes from the cuts in the shape of a sticky substance, which becomes harder the longer it remains on the tree. Every effort is being made in the Kuala Pilah district to discourage the collection of immature *damar*. Sometimes the collectors are prone to bring immature or soft *damar*, which is often confiscated and not paid for. The general requirements of the department are now being gradually understood by the Malays, and the amount of such immature *damar* which is brought to the collecting stations is very little indeed. They are beginning to understand that it pays them better to bring the best quality possible because they are paid higher rates for these and lower rates for the lower grades, and they get nothing for the immature *damar*.

Collecting Stations

For the convenience of the collectors, collecting stations have been established at various central spots in the district, easily accessible to the Malays living in the *damar* zone. These stations are open all day and are in charge of senior forest guards who are entrusted with a certain amount of cash for payment to the collectors. *Damar* is regularly brought, and weighed by the forest guards with *dachings*. Payments are made on the nail at the prevailing rates, and the signatures or the thumb-marks of the collectors are obtained on vouchers which are frequently examined by the district forest officer, who has to replenish the cash deposits at the collecting stations. The accounts are so well kept, and the system which has been adopted is so accurate, that a perfect check is possible on all transactions.

From the collecting stations the *damar penak* is brought to the central store at Kuala Pilah, where expert female labor is employed in the sorting and grading of the product before exportation. The forest department has rented out from the railway a carriage shed which answers the purpose of a store admirably. Here, under the supervision of the district forest officer, the *damar*, as it comes from the collecting station, is distributed among the women who, by long experience, are able to sort it out in the various qualities which are exported. There are Malay, Chinese, and Tamil women employed in this work and those who are experienced earn good money. In Kuala Pilah it is not difficult to get this labor, and as the output of the other states increases it will become necessary to find more room for the work. At present the shed which is being used is almost overcrowded.

The treating of the *damar* for the whole of Malaya is done at Kuala Pilah. This excellent proposal, for the concentrated treating of *damar* at Kuala Pilah, ensuring a uniformity of grading, came from the deputy conservator of forests, Mr. Kinsey, because he knew by long experience of the district that Kuala Pilah was the most suitable home for the treating of *damar* owing to the fact that there is plenty of labor there used to the work for years. There are one or two women manders in the store who keep a sharp look-out to see that the sorting is carefully done. The sorters have to guard against many devices employed by some collectors. For instance, in the early stages it was not uncommon for the Malay collectors to pick immature *damar*, and after storing it in their houses for some days to try to pass it off as mature *damar*. This ruse might succeed with the forest guard at the collecting station, and might also succeed at the store if a careful watch were not kept.

Of the other states Pahang and Johore are increasing their outputs considerably and in a short time the capacity of the present store will be fully taxed and it might even be necessary to establish a separate administration for the *damar* industry under the control of the forest department. Kuala Pilah is the home of the *damar penak* industry and the success which has so far been achieved is undoubtedly largely due to the keenness and expert knowledge which has been brought to bear on it by the deputy conservator of forests, Negri Sembilan, the whole administration of the store at Kuala Pilah reflects the importance attached to business-like methods.

The laborers employed in the *damar* industry at Kuala Pilah in 1923 numbered 302 (217 Malays 40 Sakais and 45 Mendiling or Sumatra Malays). The labor force this year has been 328 (246 Malays, 26 Sakais and 54 Mendilings). Last year the number of trees tapped was 5,590 and this year 7,247. There are eight *damar* zones in the district containing about 20,000 to 25,000 chengal trees. If all these could be tapped the employment of between 600 and 800 people would be possible. That would average about 30 trees per man and average monthly output would be about 2,000 pikuls. The output of the store last year was 1,504 pikuls of which nearly 1,248 pikuls came from Kuala Pilah, 194½ from Pahang West, and the balance from Pahang East, Perak North and Perak South. From January to July this year the output has been over 1,281 pikuls of which 943 came from Kuala Pilah, and 247 from Pahang West. Last year the revenue from Malayan *damar penak* was $87,532.50 and expenditure $40,270.28. Up to July 31 this year the revenue has been approximately $56,278.63 and expenditure $26,248.51. The best prices which have been obtained so far are $68—for pale Malayan *Damar Penak*, $55—$76, $60 for yellow, and $45—$50 for amber.

Tin Mining in the F.M.S.*—II.

Principal Mines and Occurrences of Tin Ore in South Perak

By J. B. Scrivenor, Geologist, F.M.S. Government

(Continued from August Issue, page 397)

The Menglembu Tin Deposits in Granite

NOT far from Mënglëmbu village, in the granite forming the edge of the Kledang Range, a number of ore-bodies have been discovered that have proved of considerable value and interest. Some of these ore-bodies are veins or " lodes " in the strictest sense of the word, for instance, the veins worked for some time on the hill generally known as Bukit Kambing and the veins on the top of the high hill worked by the Chendai Consolidated Company. Elsewhere, however, the ore-bodies partake rather of the nature of the pipes of tin-ore that have been worked in Cornwall, having little extension laterally, but comparatively great depth. These pipes, or chutes, of ore are best seen on the land worked by the Mënglëmbu Lode Syndicate, but before describing them it will be as well to give some account of the other ore-bodies.

The first lode worked on Bukit Kambing trended about N.E. and S.W. The dip was 32 degrees from the vertical and constant to the bottom of the workings, which reached 210 feet. The average width of the portion worked was four feet and the average yield of tin-ore was stated to be six per cent. On the hanging-wall were slickensides and on the foot-wall brecciated material with chlorite was common, so that there can be no doubt about the lode being connected with a fault. In the granite-country biotite is abundant, but in the lode it was scarce. Big felspar crystals occurred in the lode, as in the country, and although they were cut by thin veins of tin-ore they appeared practically unaltered to the naked eye. Generally speaking, the ore occurred as irregular patches and as veins. Tourmaline was common and fluorite occurred. Work on this lode ceased some time ago, although it was stated, that in the ends of the levels the ore averaged about two per cent. black tin.

In 1915 another lode was worked on Bukit Kambing. The course was 60°—240°, the hade 70° towards 330°. The vein was much like that worked formerly and evidently connected with a fault. Some purple fluorite occurred. The granite country-rock contained veins of tourmaline and a few porphyritic crystals of felspar.

On the top of the hill on the right bank of the Sungai Chendai a nnmber of veins have been prospected and are now being worked by Chendai Consolidated, Ltd. They are not far apart' they are short in horizontal extent, and some of them occur *en échelon*. An opinion is held by some, I believe, that these veins are long veins broken up by step-faulting. I examined the evidence lately in one case and found that the supposed fault-plane was a " counter-lode " and that in both the veins, connected by it, the tin-ore extended beyond the supposed fault. It is possible, nevertheless, that this objection does not apply to all the veins on the hill.

With the exception of the clear evidence of faulting in the Bukit Kambing lode, however, all the points seen in these ore-bodies can be studied in the more extensive workings and larger ore-bodies of the Mënglëmbu Lode Syndicate, although here too there are signs of the ore-bodies being connected with disturbances in the granite.

The granite country on this property is strongly jointed, the joints trending about E.N.E.-W.S.W.; and the run of the veins that form the ore-bodies is, I am told, 20° E. of N. These ore-bodies lie on a band of granite about 1,000 feet long, and one of them has been followed down for over 500 feet. Eight ore-bodies have been found along this band and the manager informs me that although they are very irregular in their behavior, opening out and narrowing down as they are followed, they may be said to average in horizontal section 60 feet by 20 feet. It has been proved that two of the pipes of ore join in depth and it is thought likely that all eight will ultimately be found to join up.

There are two remarkable points about this ore apart from the pipe-like form of the ore-bodies. One of these is that the ore consists to a large extent of very minute veins running parallel and close together; the other, that except when the percentage of tin-ore is high, which seems to be due to strong impregnation from the little veins, often obliterating the latter altogether, there is no change in the felspar of the granite noticeable to the naked eye, and little change noticeable even under the microscope. Thin sections show that brown tourmaline is common in the little veins, and metallic sulphides occur also. They also show that in some cases the veins are so minute that where there is a gap in the run of ore no fissure can beseen under the microscope, between the end of the stringer of cassiterite granules on one side of the gap and that on the other.

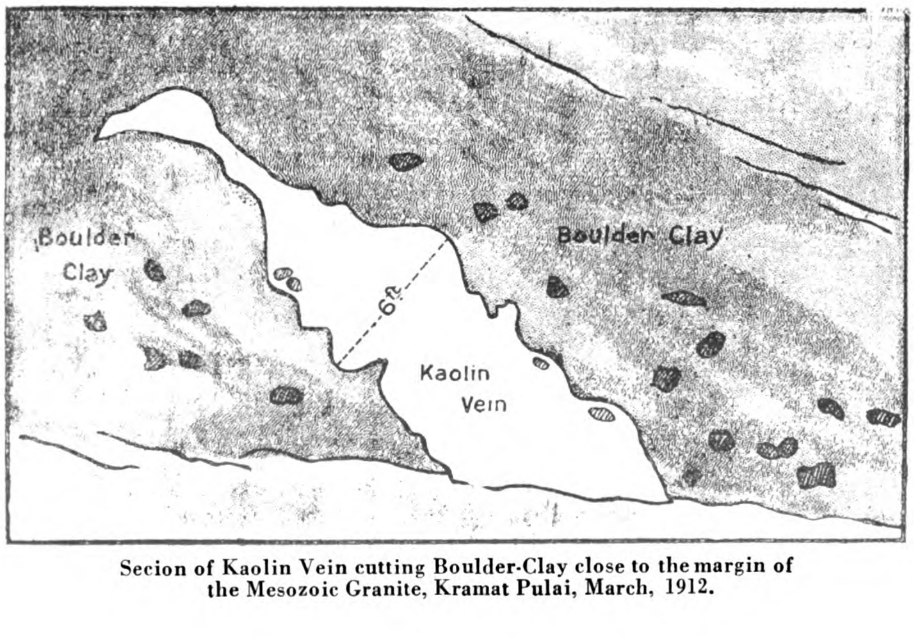
Other small veins have been opened up by Chinese in this part of the Kledang Range, and a Papan, in the gaol quarry, there is a system of tourmaline-veins in which a little tin-ore has been found.

Pulai

The Pulai tin-field is an irregular piece of flat land encircled partly by granite and partly by limestone hills. Tin-ore is found in the granite and in the crevices and caves of Koban and Lanno, but the bulk of the ore has been won from the flat land, which is a portion of the faulted limestone floor of the Kinta Valley covered by the clays and boulder-clays. The most interesting feature of these beds at Pulai is the abundance of boulders of corundum and granitic rocks. The former are very common, and the heaps of accumulated corundum in the Kramat Pulai Hydraulic Mine must run now into many tons.

In the Kramat Pulai Mine some very clear sections were seen in March, 1912, showing the junction of the granite and the clay. One section in particular attracted my notice. This (*vide* Fig. 18) showed a soft kaolin-vein intrusive into a very good example of boulder-clay. The termination of the vein in the boulder-clay was plainly visible, and on its edges were a few boulders caught up from the clay when it was intruded. I was just in time to sketch this section before it was destroyed by a monitor.

Fig. 18.



Secion of Kaolin Vein cutting Boulder-Clay close to the margin of the Mesozoic Granite, Kramat Pulai, March, 1912.

*From the Report of the Geological Department, F.M.S. government.

In 1912 a clear section was exposed of grey clay with particles of quartz and abundant corundum boulders *in situ.*

In December, 1913, there were more good exposures of the clay and granite-junction and more corundum was seen *in situ,* Some large granite-boulders were seen also, one measuring about 2 × 1½ feet. Some were *in situ* in the clay.

At this time there was a deep working resembling those at Gopeng in which limestone was exposed and also kaolin-veins cutting red clay. The manager informed me that coarse crystalline-ore was found here.

In one part of the mine there were beds of lignitic shale and clay that were evidently recent.

In 1916 a pinnacle of limestone was uncovered in which were thin veins of asbestos in the form of " mountain-leather." The composition was that of serpentine. Associated with it was purple quartz.

Pusing Bahru

In 1913 the Pusing Bahru Mine afforded the best sections of clay with tourmaline-corundum-rock boulders. Now the old excavation has been filled in with slimes and nothing can be seen of

Fig. 19.

them or of the limestone. These boulder swere particularly abundant in this mine and heaps of them can still be seen near the old puddler-site.

They occurred as boulders in a clay that is, as far as physical characters are concerned, a typical glacial boulder-clay. An interesting feature of the clay is that the fine corundum in the rock floor has become hydrated and yields a high percentage of aluminium hydrate soluble in hydrochloric acid.

The floor of the Pusing Bahru Mine was limestone. Several well-marked " cups " were uncovered, lined with the Gondwana boulder-clays and filled with sand lignite and elsewhere the limestone surface was very irregular and broken up by pinnacles.

The clays covering the limestone were generally grey or brown, sometimes showing slickensides, and the commonest boulders were those of the tourmaline-corundum-rocks. Once a vertical pipe of pale-colored mottled clay was found in the darker clays. This was not a kaolin-vein, but probably marked the bleaching action of a slow current of water either from above or from a spring in the limestone.

Above the boulder-clays were sandy beds and lignite. The sand contained tin-ore, sometimes as much as three katis to the cubic yard, and in some sections I have seen small boulders of the tourmaline-corundum-rocks in the lignitic sands, close to the junction with the boulder-clays.

From time to time sections were exposed in the Pusing Bahru Mines for which it was very difficult to find any clear explanation. The late general manager, Mr. W. M. Currie, thought that the clays had been to some extent rearranged by recent river-action, and brought forward as evidence the tin-ore, which he thought to be distinctly water-worn. I cannot see, however, that the ore is more worn than in the supposed glacial beds generally, and think that the sinking of the clays on to the dissolving limestone may be the cause of the difficulties referred to. It would, for instance, be possible in this way to account for fragments of wood and patches of sand being found in clay immediately above the limestone, as, during the sinking movement, some of the younger lignite and sand might become mingled with the older Gondwana clays.

Redhills and Pusing Lama

These two mines are worked on the slopes of a hill composed of clays and soft, laminated, and very much disturbed beds, that are, for the most part, stained a deep-red, which has given rise to the name " Redhills." Unfortunately, this deep-red staining makes it difficult to see all that one could wish of the structure.

In the Redhills property is a boulder-clay in which the tourmaline-corundum-rock boulders were so thickly packed together that when the exposures were less clear than they are now, it was thought that the tourmaline-corundum-rock was strictly *in situ.* With these boulders were numerous boulders of argillaceous schistose rocks with corundum. On Pusing Lama a light-colored clay with boulders of tourmaline-schist and quartz was once exposed at the bottom of a tributer's *lombong.*

In both mines veins of secondary ore have been found, the most notable being the Pusing Lama lode, a rich vein of tin-ore at the contact of the clays with a soft granitic intrusion. The unexpected discovery of this lode after flotation saved the company from disaster. It was said to have been completely worked out before 1913, but lately a *lombong* has been opened up by tributers on the junction of the clay and the granitic rock and much ore has been won from it, which is doubtless the remains of the old lode.

Occasionally an exceptionally large boulder is washed out of the clay on Pusing Lama. On the higher ground, where bedded argillaceous rocks are exposed, there are no included boulders, or boulders of tourmaline-corundum-rocks lying on the surface. On the other hand, there are large amounts of ironstone on the surface that formed in the weathering shales, and also aluminous concretions.

Behind Redhills there is a big open-cut in which Chinese miners have cut into the shaley beds, and judging from the character of the work, the tin-ore obtained in this open-cut may have been an original detrital constituent of the shales, or of some thin quartzites associated with them. In some of the shaley beds I saw in 1911 masses of tourmaline-rock, suggesting that the beds might be boulder-clays with lamination induced by earth-movements, but, on the other hand, the tourmaline-rock may possibly be the result of veins breaking up during recent movements, due to the softening of the shales on a hill-slope and the solution of the limestone below, although I do not think this likely.

The tourmaline-corundum-boulders are more abundant in the vicinity of Redhills and Kacha than in any other locality. At the entrance to Redhills there is a road section that shows the boulder-clay.

Rotan Dahan

The Rotan Dahan Mine is a large excavation on rising ground close to the road between Batu Gajah and Pusing. Most of it is now filled with water and tailings, but the road has been diverted to allow of further mining. In this mine there was once visible a great thickness of unstratified clay with boulders. The greatest depth of clay was about 140 feet. The clay carried angular tin-ore from top to bottom and on several occasions native copper has been found with it, sometimes as sharp, minute crystals. The boulders are of pale-colored tourmaline-schist, sometimes with tin-ore, and of schistose tourmaline-corundum-rocks. A fault was once observable in the limestone and slickensides were seen in the clay close to it. No granitic intrusion has been seen as yet in the limestone or clay at Rotan Dahan. Recent sands were exposed above the clay in 1915.

The Serendah Hydraulic Tin Mining Co.

This is the only large mine of particular interest in the portion of Sĕlangor dealt with in this article. The company was floated prior to 1907 and worked with monitors on the slopes of the hilly country to the east of the road leading north from Sĕrĕndah. At first only soil was worked, but the country rock was laid bare and found to be a soft granitic rock with a few veins of quartz carrying a little tin-ore and veins of a rock resembling greisen, also carrying tin-ore. In the biggest working these veins had a general north and south direction.

In another working was a " lode " which appeared to be a repetition on a large scale of the veins of greisen-like rock. The direction was W.N.W.-E.S.E. It extended for about 150 feet and had a breadth of 20-30 feet. The rock was composed of quartz, white mica, tourmaline in small masses of needles that gave the rock a spotted appearance, kaolin, and small crystals of cassiterite.

Later on, the operations of this company exposed the junction of granite and schists.

Siputeh Tin Mines, Ltd.

The Siputeh Mine, now worked on tribute, showed in its earlier days some excellent examples of " cups " in limestone with a lining of stanniferous clay and a filling of lignite and sand.

The boulders in the clay are mostly of tourmalinized sandstone with quartz-veins and yellow crystals of cassiterite. In one face a hard flat boulder of granite was found and two or three boulders of a softer granitic rock with crystals of cassiterite.

At the time of writing (1915-1916) the only important work going on is in the tributer's big mine near the railway. Here an excavation has been carried down to about 120 feet with limestone on one side and weathered and contorted quartzite and shale on the other. The relation of these latter to the boulders is discussed elsewhere. In 1914 a quartz-vein was seen in the limestone in this vein.

When the Siputeh Mine was first opened great trouble was caused by the limestone cups. Their presence had not been suspected and the first excavation made ended abruptly against a solid vertical wall of crystalline limestone that made progress impossible.

Tambun

In the vicinity of Tambun village, north of Ampang, deep clays with angular tin-ore occur, but the clays differ from those elsewhere in containing very few boulders. In 1913 they were well exposed in the New Tambun Mine and a few boulders were found there. One was of tourmaline-granite ; another was gneissose.

In the New Tambun Mine the bed-rock was found in one place to be dolomite, and soft, weathered bedded-rocks were also exposed. Their relation to the clay was not clear but they may have been faulted down against the clays, just as the clays were faulted down against the limestone. The manager at that time informed me that bores had been put down to 80 feet in these rocks, and that they were generally sandy and yielded a little tin-ore throughout. They were traversed by numerous thin kaolin-veins.

In Towkay Leong Fee's Mine at Tambun both clays and soft phyllites, etc., are exposed, and both have been invaded by large granitic veins. It is probable that the large amount of tin-ore won from the clays has been in part introduced as an impregnation from these veins. Small veins of a similar nature have been found traversing the limestone bed-rock. The clays vary in color and immediately above the limestone they sometimes contain pyrolusite, but not in sufficient quantity to be of value as manganese-ore.

I have not seen any boulders from these clays excepting a few lumps of cassiterite, which, however, might possibly have been secondary tin-ore derived from the granitic veins.

In the Tambun Mine also the relation of the phyllites, etc., to the clays is not clear. They are very highly inclined.

The clays sometimes show traces of lamination.

I have been informed recently that the bedded argillaceous rocks sometimes contain good tin-values. Amongst these bedded-rocks I have found moderately hard sandy tourmaline-schist.

Tapah

Tapah is the centre of a small mine-field that is distinguished from other mine-fields in South Perak by producing an appreciable amount of gold as well as tin. It has also been a source of wolfram for a numberof years.

The mineralization of this area results from the existence of an isolated out-crop of granite that extends from Jong Landor estate in the north nearly to Bidor in the south. In the north there are out-crops of hard non-porphyritic granite ; towards the south the out-crops are of soft granitic rocks rich in kaolin. The junction between the granite and the sedimentary rocks on the east almost coincides with the road. On the west it is hidden by vegetation and alluvium.

On going southwards from Tapah one comes first to Bukit Mas, on the left of the road. This locality is well known as having been the site of mining-operations on a gold-lode prior to 1904. In 1911 interest was revived in the place and some prospecting done and it was possible to get definite information about the occurrence of the gold. In a new adit it occurred in quartz-stringers in weathered schists, and a Chinese who had worked in the old mine stated that all the gold had occurred in this way. Prospecting in the soil near the old workings showed gold to be present, but not in large quantities.

Reasons have been heard of for the failure of the old mine. They all concerned difficulties in the work, particularly driving under the floor of the valley where the mine is situated. Judging from the information received, however, and the position of the old workings, I am inclined to think the real reason why Bukit Mas failed as a gold mine was the same as that which ends many a mine—namely, that there was not enough gold to pay.

Gold is still won by Chinese working for tin and is separated. A concentrate from Batang Padang in the Perak museum collection, and which probably comes from near Tapah, contains gold, cassiterite, and native copper in sharp crystals. The copper crystals are slightly larger than those found at Rotan Dahan in Kinta. Near the site of the old gold mine there are extensive *lampans*, mostly deserted. The country rock is weathered phyllite striking about north and south and dipping steeply westwards. Numerous small quartz-veins and a kaolin-vein traverse the phyllites and small boulders of granite are found on the surface.

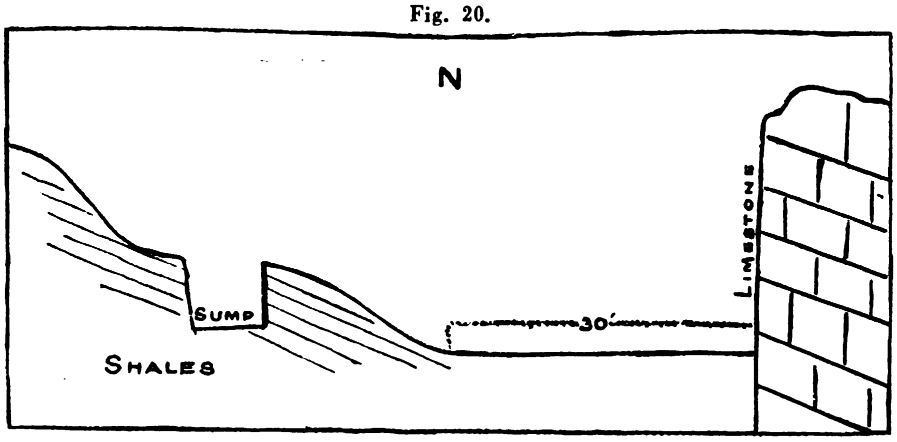
On the opposite side of the road from Bukit Mas, is a steep hill (668 feet) of tourmaline-granite, named Bukit Rĕmbian on the survey department maps. This tourmaline-granite is the source of the wolfram that has been exported from Tapah. It occurs with tin-ore in small quartz-veins. The tin-ore, and perhaps the wolfram too, may occur as a dissemination. In the soil the ore is fairly evenly distributed, but that may be entirely due to soil-creep.

From Bukit Rĕmbian one gets a very good view of the quartziet hills in the southern part of the Batang Padang district, and of Changkat Jong in Lower Perak.

South of Bukit Rĕmbian there are the remains of extensive mining-operations in the Jangka Valley, in granitic rocks on the west of the road, in phyllites and quartzite on the east. The granitic rocks are veined with kaolin and quartz, and there are quartz-veins in the phyllite. Tin-mining operations are now going on at the southern end of the granitic exposures near Bidor, and near Bruseh gold also has been worked.

In 1915 the output of gold from the Batang Padang district (mostly, if not all, from the vicinity of Tapah and Bidor) was 1,285 oz. valued at £4,980 as against 935 oz. in 1914.

Fig. 20.



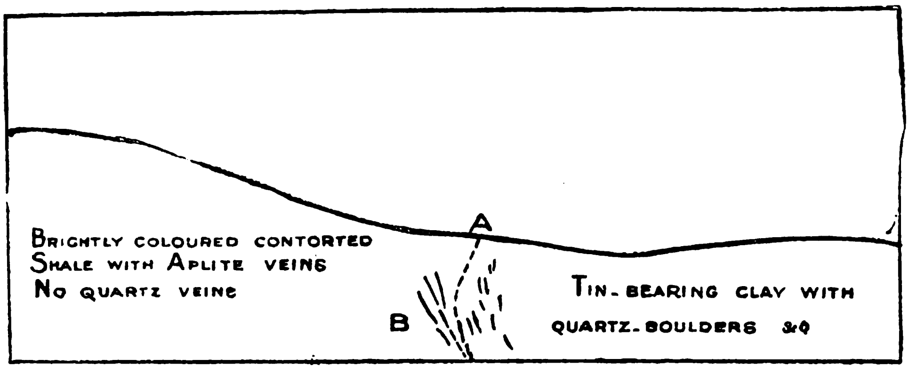
Section in South Tronoh

Tanjong Toalang

The little tin-field at Tanjong Toalang, once a big producer of ore, attracts attention on account of its isolation and the difficulty, at first sight, of finding any reason for its existence. The country consists of rolling hills formed of quartzite, shales, and tourmaline schists. The latter suggest the presence of tin-ore, but cannot be the source of the richer deposits that have been worked. Near the village, however, there is abundant evidence of granitic intrusions rich in kaolin having invaded the sedimentary rocks, and the most prosperous mines have been found in the vicinity of these intrusions. I have been told that in one mine a small vein of tin-ore was found, but the details of its occurrence could not be ascertained.

These granitic intrusions are not unlike the kaolin-veins that cut the clays at Gopeng and Tambun, and it is probable that they

Fig. 21.



Section in Tronoh Mines, Ltd.

are connected in depth, like the granitic intrusions at Tronoh, with the Kledang granite-mass. The occurrence of these intrusions and of old tin-workings at Bias Tujoh, near Kampar, may mean that the Kledang and Bujang Mëlaka masses are connected at no great depth below the present surface.

An interesting point about the Tanjong Toalang tin-field is the occurrence of boulders of the tourmaline-corundum-rocks. I have seen these in one place only, heaped up beside a small flooded mine close to the police-station. I have not been able to see how they occur in the mine, but their presence shows that the Gondwana clays occur here as well as the quartzites and shales.

Tronoh

The village of Tronoh is the centre of a prosperous mine-field, which contains the well-known mine belonging to the Tronoh Mines Co., Ltd., also Towkay Chung Thye Phin's Mine and the Tronoh South Mine, which are the only mines that need be described in detail here.

Between Tronoh South on the one hand and Towkay Chung Thye Phin's Mine on the other, there is a gap. It has yet to be proved whether the two mines are connected by a continuation of what is generally referred to as the "Tronoh lead." The term was borrowed from Australia where "deep-leads" are known and was first applied, I believe, by an Australian miner to the Tronoh deposits, which are conspicuously different from the Australian deep-leads, the chief point about the latter being that they are old alluvial deposits buried under flows of lava. I have not seen evidence of such a state of affairs anywhere in the Federated Malay States. What is known as the "Tronoh lead" is a huge trough in the limestone bounded on the west by a fault-face of shales and quartzites with granitic intrusions.

The dominant factor in the structure of this part of the mine-field is a reversed-fault which is clearly exposed in all three mines. It trends about N. N. W..-S. S. E. and hades at about 45° to the east. On the west are the quartzites and shales and granitic intrusions, in the vicinity of which a hard hornstone is formed. There are also numerous small fissures bounded by tourmalinized shales. On the east of the fault is limestone, which forms a trough close to the fault and rises nearer the surface on the east.

The following evidence of dips has been collected. In the quartzites and shales the bedding is much disturbed in the north part of the Tronoh Ltd. Mine. In the main part of the mine the dip is gentle to the W. N. W. near the edge of the excavation, but nearer the centre it is to the E. S. E. and S. E. In Towkay Chung Thye Phin's Mine the dip as seen on an incline cutting across the strike is 45° to the E. S. E. In Tronoh South good observations of the dip were obtained in two sections close the limestone (*see* Fig 20). It is about 20° to the E. S. E. Other easterly dips have been observed in Tronoh South.

In the limestone, which is now exposed in the bottom of all three mines, a dip of about 60° to the S. E. can be seen in the Tronoh Ltd., main excavation and in Tronoh South the dip is about 20° to the E.S.E. in some places to the east. In Chung Thye Phin's Mine the dip of the limestone has not been seen clearly.

In the Tronoh Ltd. Mine recent work has largely destroyed the smooth fault-face on the west of the excavation, which, hading to the east, showed that the fault is reversed.

In the quartzite and shale small subsidiary faults are present, which not infrequently break the course of aplite-veins traversing these rocks. The big faces of these rocks in the three mines afford very good sections. In 1914 a section was seen showing as clearly as a text-book diagram shales traversed by abundant minute kaolin-veins and by fissure-veins with quartz as a vein-mineral and tourmalinized shale one ither side.

Wolfram was found in 1915 in a quartz-vein. I have been informed that there is only a little tin in the shales and quartzite.

Tourmaline, generally brown, is the commonest metamorphic mineral in these rocks, but other minerals have been found. The heavy minerals separated from a specimen of altered sandstone (not seen *in situ*) in 1905 were tourmaline, cassiterite, corundum, and perhaps topaz. Minute octahedra resembling spinel also have been found in sections of these rocks. Epidote and fluorite occur.

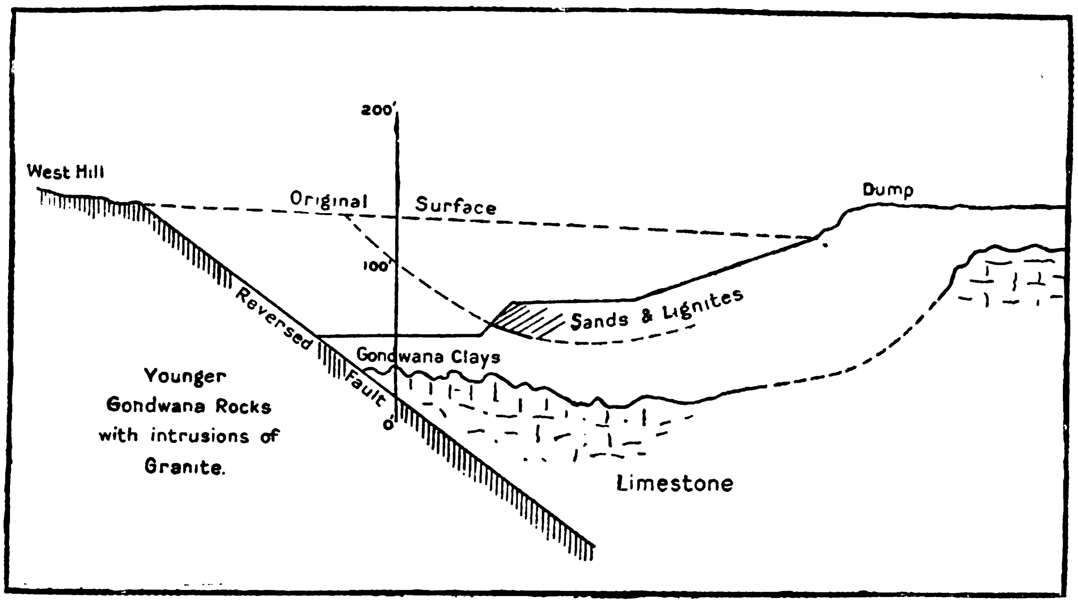
On the east side of the fault a mass of recent sand and partially carbonized vegetation overlies the limestone, and perhaps the tin-bearing clay also.

Fig. 21 is a typical section showing the relation of the pay-dirt, or *karang* in the Tronoh Ltd. Mine to the shales. On the left (W) are contorted shales with aplite intrusions and, I am told, a little tin-ore, probably derived from them. At B are a few small pieces of quartz. At A is a line of division between the shales and the pay-dirt. It is not very distinct but is nevertheless a line of division. The pay-dirt on the right of it shows some sign of streakiness and contains boulders. The amount of tin in the *karang* is greatly in excess of that in the shales.

In Towkay Chung Thye Phin's Mine, a noticeable feature ist he narrow gut between the shales on one side and the limestone on the

(Continued on page 601).

Fig. 22.



Section of the Tronoh Opencast Mine, looking NNW.

Reduced fram a Section drawn to Scale. The vertical line gives heights in feet. The original surface is shown by a dotted line. The west wall of the Open-cast Mine coincides with the reversed fault-plane. The presence of this fault was probably the cause of the formation of the "Cup" in the limestone, surface water finding it an easy channel downwards. The curved dotted line indicates the probable inclination of the Gondwana clays before mining commenced.

The Morse Fuel Oil System

Installed on the T.K.K. Steamships

IN the two short years since its introduction into the marine and industrial service, the Morse system has attracted wide and favorable attention because of the many new features until to-day Morse-equipped ships may be found throughout the seven seas. As a result of this rapid progress it has placed the burner with the leading types of similar apparatus and has caused ship owners and operators throughout the world to give serious consideration to the Morse burner when contemplating an oil-burning installation.

Having installed all types of oil burning equipment for the last twenty-five years, Morse engineers were able to observe each burner in actual operation and to determine what the outstanding characteristics of each type of equipment were. By combining these features and adding thereto some distinctive designs of their own, Morse engineers created the Morse fuel oil system.

Briefly, the Morse system for marine service may be divided into two kinds of equipment, natural draft and the combination natural-forced draft. It is based on the principle of forcing fuel oil at proper pressures through a burner or atomizer which can be regulated without changing the pump pressure. Following this controlled and fine atomization the supply of air for combustion, under complete regulation, enters the fire box at sufficient velocity (due to the Venturi design of Morse register) and at right angles to the oil spray so that a perfect mixture takes place at the burner tip, both the oil and the air entering the combustion chamber in a whirling motion so arranged that air is admitted to the combustion space. The advantages and benefits are obvious.

Illustrations above clearly show the basic principles of the Morse burner ; how a wide angle of uniformly and finely atomized oil is secured ; how complete intermixture of oil and air are brought about in the *front* end of the furnace and the convenience of the regulating levers.

Following are some of the important features of the Morse Fuel Oil System :

1. Full utilization of boiler heating surface because combustion takes place in the front of the furnace.

2. No danger to rear staybolts or brickwork, due to flame impingement. This feature alone has been the means of considerable saving to owners of Morse-Equipped vessels.

3. When it is advisable to have slightly reduced conditions, or if it is necessary to shut off the air supply entirely, it is much more easily done with the Morse Type of control.

4. Flexibility of control and complete atomization coupled with the unusual regulation and application of air supplied by the Air Register, result in smokeless flame and the highest attainable percentage of CO_2.

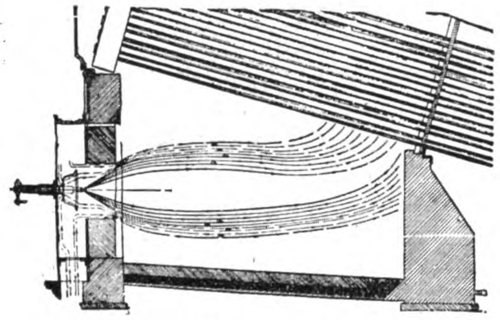
5. Fuel Oil pressure at orifice constant at all times.

6. Oil completely atomized at all stages of flame intensity, whether high or low.

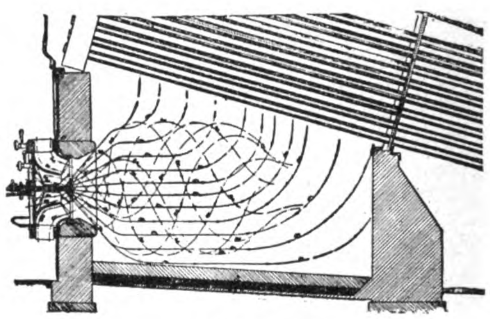
Not only has the Morse Fuel Oil System received a warm reception in American shipping circles, but foreign ship owners as well, have expressed their hearty approval. This is substantiated by the fact that the Toyo Kisen Kaisha have equipped six of their vessels with Morse Burners. Following are given some interesting figures taken from the log of the s.s. *Biyo Maru*, one of the six Toyo Kisen Kaisha vessels to be fitted, while on her first trip.

Type : Turbo Electric.

Steam pressure	220-lbs.
Number of boilers	3
Actual No. of boilers used	2
Actual No. of burners used	6
Average speed in knots	10.51
Average fuel oil consumption per day-tons	17.45
Fuel oil consumed per kw	1.41
Fuel oil consumer per SHP	1.05
SHP	0.86-lbs.
FUEL OIL CONSUMED PER IHP per hour, including auxiliary machinery	.90-lb.



The Ordinary Way



The Morse Way

These figures were taken from her first trip and there has been a further reduction in fuel consumption in active operation.

This success has not been confined merely to vessels of the Toyo Kisen Kaisha.

A recent installation is worthy of mention here. The s.s. *Rosalind* of the Red Cross line is a combination freight and passenger ship running between New York, Halifax and St. John. About three years ago it was decided to remove the coal-burning furnace fronts and install one of the leading oil-burning systems in the field. After a year's operation the owners were not entirely satisfied with the performance of the vessel and asked another manufacturer of oil-burning apparatus what saving they would guarantee were their burners installed.

Accordingly, this other burner was given a trial with the understanding that a certain saving had to be made. When the trial period was over a saving of less than ½ of 1 per cent. had been effected—*far below the guarantee*. The Morse company was then asked what they could do in the way of decreasing fuel consumption. Before committing themselves a careful survey was made to ascertain exactly what conditions had to be met and after a conference of Morse engineers, a proposal was made whereby the Morse company guaranteed to save 7 per cent. of the fuel consumption over a trial period of eight voyages. Upon the expiration of the eight voyages an average saving of approximately 11 per cent. had been obtained—considerably over the original guarantee.

Additional figures on other Morse oil-burning conversions can be obtained by writing to the American Trading Company, of Tokyo and Osaka, Japan, where the Morse company has an engineer who can give prompt and efficient service.

The Morse fuel oil system is manufactured by the Morse Dry Dock & Repair Co. of Brooklyn, New York, which company has been continuously engaged in the ship repair business for the past forty years. They maintain a permanent combustion engineering staff, who will be glad to contribute their years of experience gained in fuel oil burning, to assist ship owners and operators in solving their combustion problems.

Tin Smelters in Malaya

Straits Trading Company, Ltd.

THE largest and best-known of the active tin-smelting companies of the world—which, with the exception of the scattered plants in the island of Banca, are to-day all under the British flag—is that of the Straits Trading Company, an undertaking founded in 1887. Its origin, which it shares with other tin smelters of to-day, was due to the development of a successful ore-dealing agency carried on by Messrs. James Sword and Hermann Mühlinghaus in Sungei Ujong and Selangor, in the southern part of the Federated Malay States. In those earlier days of the tin industry of Malaya the smelting of the ore was carried on by Chinese kongsis according to the primitive methods employed by the Chinese. However, the success of the ore-dealing business encouraged the partners to attempt to advance their business a stage further by undertaking smelting themselves, being assured of an adequate ore supply, and accordingly they erected a small reverberatory furnace at Teluk Anson, in the state of Perak. The first essay, however, was not successful. The promoters, however, were not discouraged, and not long afterwards a more serious attempt to operate on European lines was attempted, and smelting works were erected on the island of Pulau Brani, in the harbor of Singapore, which, progressively remodelled, re-equipped, and enlarged, constitute to-day the main site of the company's activity. In 1902 a second smelting works was started at Butterworth, in province Wellesley, which also has steadily developed, and was completely modernized, as well as being greatly enlarged, after the war. Mr. Mühlinghaus was the leading spirit in the earlier developments, as well as being very largely interested in the company for many years, finally retiring in 1902. Meanwhile the capital of the company was steadily increased from the original $150,000 up to a present capital of $15,000,000, of which $9,000,000 is issued capital. The original ore-buying business from which the company originated has remained an integral part of the undertaking. The company maintains its agencies in all mining centres of Malaya, and in process of time has extended its ore-buying business further afield. Undoubtedly, however, the main factor of success, apart, of course, from technical efficiency and good management, has been its geographical association with the largest tin-producing field in the world. With the exception of the mines worked to-day by the Pahang Consolidated, practically the whole of the Malayan output is alluvial, giving a high-grade and clean concentrate, which has done much to secure for Straits tin its leading position in the world's markets. In fact, the most serious danger which has threatened the company was the attempt made by American interests, through the medium of the International Tin Co., to enter the Malayan field as an ore buyer on a big scale and ship the concentrates to the smelter which they were erecting at Bayonne about 1903. The American design aimed at differentiating between pig tin and tin ore in respect of import duties, thus creating protection for a tin-smelting industry in the U.S.A. This threat was, however, decisively countered by the F.M.S. government imposing a prohibitive export duty on ores exported for smelting outside the empire.

As the business grew the company became a buyer in Australia and later in South Africa, and though the Australia trade is no longer a business proposition, owing largely to the decline in the output of tin ore there and high tin freights from the Straits, the company has, since the war, retained much of the South African business. Just after the outbreak of war the company made a determined effort to penetrate into the remote Yunnan field, sending a representative up to Kochiu. Progress, however, owing to vested interests, was very slow, and when their representative died on the field, the directors decided, in view of the growing disintegration of any centralized government in China, that any scheme of the kind was a waste of time under present conditions, and for some years past they have retired from the field. In view of the great demand for tin which developed during the war, they also sent a representative to Bolivia, who purchased a certain amount of Bolivian concentrates, but here again free ores of good quality were scarce and freight conditions adverse, so that after the death of their agent this attempt was also not proceeded with.

Meanwhile, the more natural source for further ore—the Dutch Islands—were not neglected. For many years a portion of the Billiton output had gone regularly to Pulau Brani, and the results were so satisfactory to the Billiton company that, later, arrangements were made for the whole of the output to be treated by the Straits Trading Company. This supply increased so largely in recent years—rising to just under 12,000 tons of metal in 1922-1923—that it became quite an important source of supply. Later on the company were able to offer the Dutch government terms which induced them to ship a portion of the Banka output also for reduction in the Straits, and this arrangement still continues. Finally, the Straits Trading Company receives the small amount of concentrate which is produced annually in Alaska. It will thus be apparent how it is that the Straits Trading Company is in a position to produce more tin than is actually mined in the Federated Malay States, notwithstanding the fact that a portion of this output is handled by the Eastern Smelting Company, as well as nearly 6,000 tons by the Chinese smelters still in the F.M.S.

The actual capacity of the company's combined works rises to-day to the high figure of 60,000 tons per annum, but, like all large smelters, it is a great practical convenience to have a considerable excess over ordinary requirements to allow for emergencies as well as for repairs and renewals of plant. As the company strictly confines itself to its business of ore buying and smelting, the sales correspond closely with production, and these in recent years figure as follows :—

Year.	Tons.	Year.	Tons.
1907	40,205	1916	43,507
1908	47,768	1917	37,887
1909	40,297	1918	36,241
1910	35,346	1919	37,315
1911	38,252	1920	28,294
1912	36,489	1921	27,759
1913	43,017	1922	39,690
1914	41,718	1923	45,514
1915	47,249		

Some idea of the magnitude of the operations may be gathered from the accompanying block, which shows a part of the refinery at Pulau Brani. Altogether, in the course of its history, the company has sold 435,000 tons of metal, of a total value in round figures of £100,000,000.

The company's works have always been regarded as among the most efficient in the world. To-day the smelting is done in large regenerative reverberatory furnaces with gas firing, and quite lately the experiment has been undertaken of fitting a Cotterell precipitation plant to deal with the furnace gases, which always carry a certain amount of tin, either volatilised or in the form of fine particles.

The Straits Trading Company is registered in Singapore, and constitutes one of the most important undertakings in the colony. The conveniences which it offers to miners as an ore buyer have contributed substantially to the development of the tin industry in the neighboring states, and the Malay government has not been slow to utilize its services and that of the sister smelter, the Eastern Smelting Company, in the very difficult and delicate operations which it undertook on several occasions in recent years when carrying tin during periods when the market was entirely disorganized. In fact, without these great ore-buying and smelting undertakings it is difficult to see how the great tin-mining industry of Malaya could have reached its present achievement.

The Eastern Smelting Company

There is no branch of the mineral industry which more widely reflects British influence than tin. The widely-separated sources of production—the East Indies and Bolivia are almost antipodal—have an analogy with the world-wide extension of the British empire, while historically Cornish dressing and reduction practice have spread the world over, and in this most staple of metals still remain generally standard practice.

The Straits Settlements have long been the great centre of tin production in the world. Last year, out of a total world's supply of approximately 126,000 tons, Straits shipments amounted to no less than 66,297 tons. While a small portion of this was from the small primitive blast furnaces of the Chinese miners, more than 90 per cent., probably was from the two great European-controlled enterprises, the Eastern Smelting Co., and the Straits Trading Co.

The Eastern Smelting Co., unlike its sister enterprise, is of comparatively recent origin. It was started as recently as 1911, largely through the initiative of Mr. H. Jessen, who succeeded in interesting the firm of Vivian Younger & Bond, with their wide experience in tin smelting, in the possibilities offered by the East, while the support of Sir Ernest Birch assured intimate knowledge of tin-mining conditions in the Malayan Peninsula.

Steadily achieving success, the new company made rapid strides, and to-day, with one of the chief smelting equipments in the world, it is with its associations one of the four great factors in the tin-producing capacity of the world.

In the Malay Peninsula the Chinese smelt tin ore by a primitive method, in small clay shaft furnaces (known as " relau "), in which charcoal is used as the reducing agent, whereas European smelting companies use large reverberatory furnaces, coal being the reducing agent.

Eastern Smelting Co.'s Practice

The following details of practice are kindly supplied by the company. Smelting in reverberatory furnaces is carried out as follows. The tin ore is mixed with coal (anthracite), a little lime is sometimes added, and the whole is then fed into the furnace through the charging doors. The charge is levelled by means of a long-handled rake (rabble) introduced through the charging or working doors ; the doors are then closed tightly, and a regular fire is applied for a period ranging from five to twelve hours. At the end of this period the fused mass is thoroughly stirred, this being done through the working door, the position of which, under the chimney, prevents the in-rush of air from coming in contact with and oxidising the tin. After this a strong heat is applied for a period of one to two hours, and the charge is again stirred.

The reduction of the tin, as well as its separation from the slag, should now be complete. The tin is drawn off through the tap-hole into a float or kettle, from which it is ladled into moulds, and the slag is run off into slag beds.

The products of this process are crude or furnace tin and slag. The slag, which is rich in tin, is again smelted, giving a poor tin, rich in iron, and a final slag, the tin content of which is negligible.

Refining.—The crude tin drawn off from the furnace is usually impure, and contains different metals—*e.g.*, iron, copper, lead, antimony, arsenic, and bismuth. As these impurities detract from the market value of the tin, it is necessary to remove them by a process of refining, which consists of liquation and " boiling " of the tin. The ingots of crude tin are melted down in a furnace at a low temperature, and the molten tin is allowed to run into a large iron pot or kettle, the less easily fusible metals remaining behind on the bed of the furnace. The tin which collects in the kettle is kept molten during the " boiling " by means of a fire underneath. The " boiling " consists of introducing into the bath of heated liquid metal a log of green wood. The wood, at the high temperature, undergoes dry distillation, and the gases and vapours given off set up a bubbling action in the bath of metal. By this means every portion of the mass is brought into contact with the air, the foreign metals and a portion of the tin being oxidized. The oxides collect together in a foamy mass the so-called " boilscum " on the surface of the metal. The duration of boiling depends on the state of purity to which it is desired to bring the tin ; if a high degree of purity be required, the boiling must be continued for many hours. It is continued until the surface of the molten metal, after removal of the scum, is bright and shining, after which the molten mass is allowed to stand for some time, in order that the heavy impurities in the tin, especially iron and copper, may settle to the bottom. After this the scum is skimmed off, and the refined metal is ladled into moulds. It is then ready for the market as pure tin, and is shipped to all parts of the world.—*Mining Journal.*

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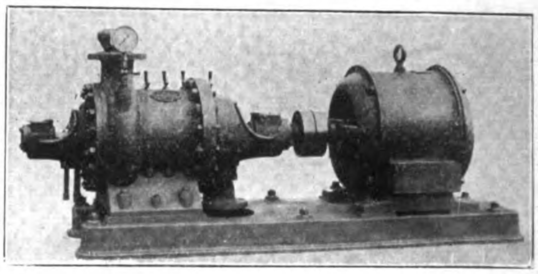

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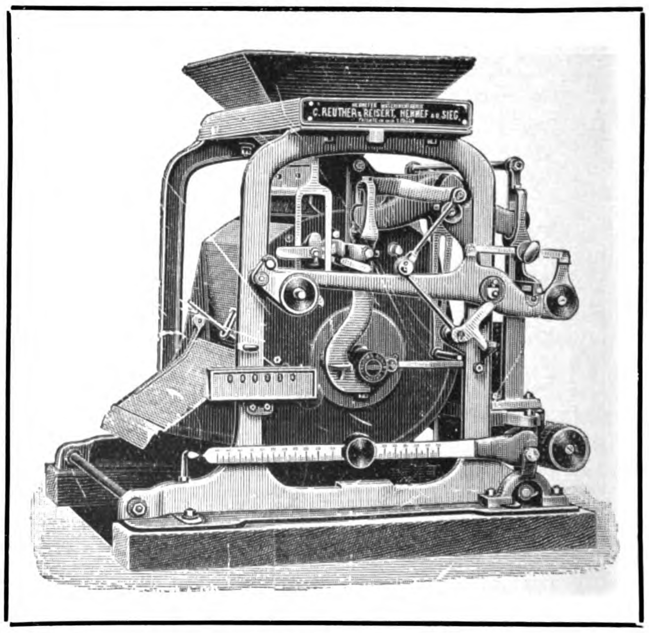

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Sets $30.00 and up

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Head Office and Factory, Chicago, U.S.A.

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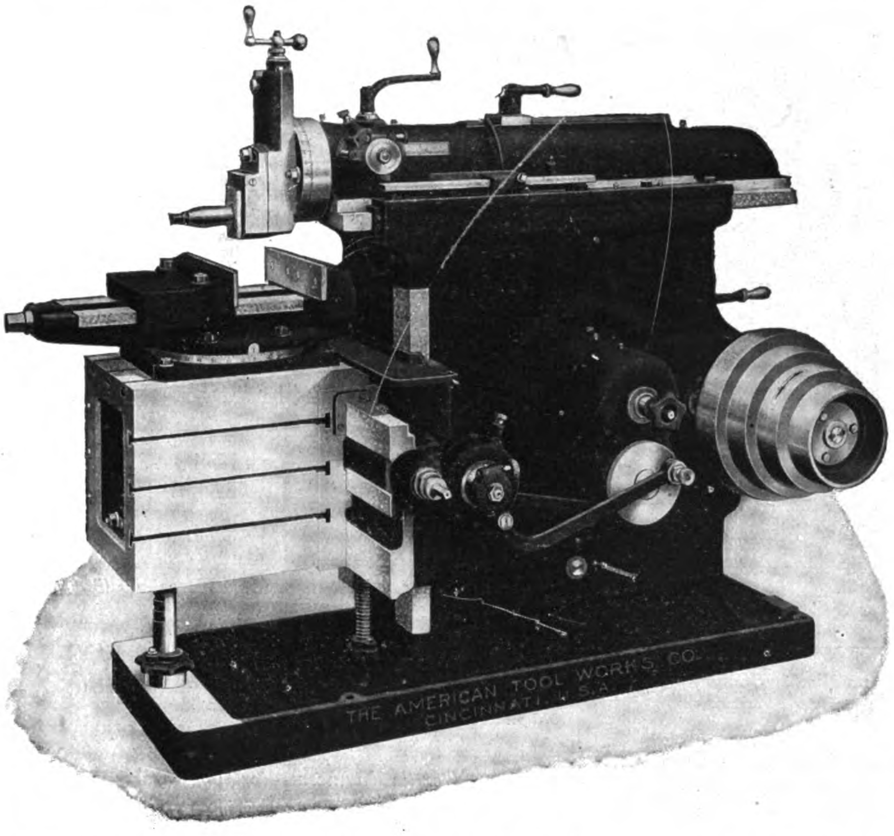

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If you want a Shaper you can depend upon for convenience and economic production, don't fail to find out all about this new

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Because of its tremendous power it is admirably adapted to heavy manufacturing, while its accuracy and ease of handling has made it a favorite in the tool room. Don't let this opportunity pass; *write us immediately.*

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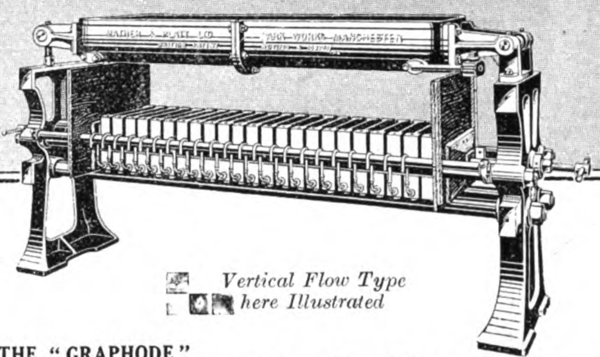
Lathes CINCINNATI, U.S.A. Shapers-Radials

ELECTROLYSERS—for the production of Sodium Hypochlorite for Bleaching and other purposes



Vertical Flow Type here Illustrated

BELOW: THE "GRAPHODE"

Patent Electrolyser—for producing Sodium Hypochlorite in small quantities for use in laundries, bleach works, and for water purification

ANY machine which can add to the quality of your products and, at the same time, lower their cost of production, is well worthy of consideration. An Electrolyser, for instance, will produce from common salt and water, a bleaching solution (Sodium Hypochlorite) which is far more effectual than "bleaching" powder.

For Better Works——————Because

Sodium Hypochlorite contains no lime. Sodium Hypochlorite Solution, therefore, leaves no objectionable deposit on or in the fibres of the bleached material —and faults (which might arise from undissolved particules of lime were "bleaching" powder used) are entirely obviated. These faults are, briefly: Irregular bleaching—or sometimes a yellowish cast in the bleached material; hard or brittle fibres; and the difficulty of removing the lime deposit by washing.

Representatives: In Shanghai: Mr. F. Fletcher, 47, Szechuen Road

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The use of Sodium Hypochlorite Solution ensures a perfectly white and soft material of good "handle"—and in addition, allows it to be more evenly dyed and finished.

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Sodium Hypochlorite Solution is made day by day as required, and is of perfectly uniform and definite chlorine strength. "Bleaching Powder" must be stored and thus deteriorates in quality. Corresponding to this loss of strength in storage there is a monetary loss, which is very considerable in hot countries remote from sources of supply.

"Mather & Platt" Electrolyser—both Horizontal and Vertical types—are built to give prolonged and efficient duty. Our extensive research experience is always available and forms part of our service.

If you are interested, let us send you Brochure T 475

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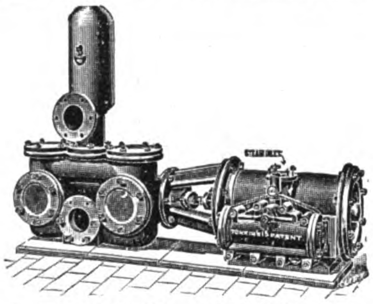
WE MANUFACTURE

PUMPS

FOR EVERY PURPOSE

To be worked by HAND, STEAM, BELT, WIND, WATER or ELECTRIC POWER



STEAM PUMP for General Purposes

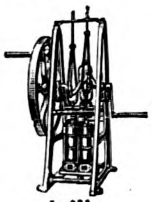
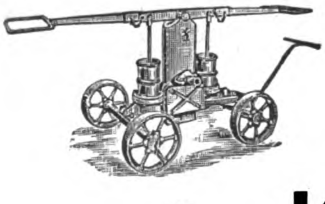
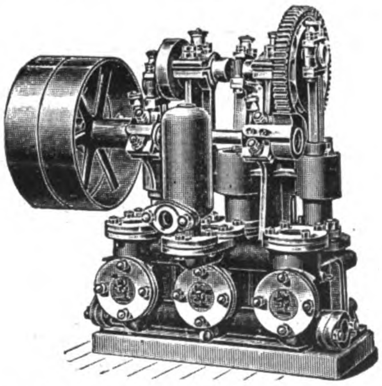
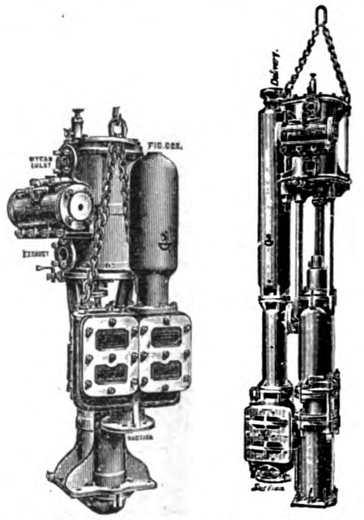


Fig.228.

Fig.160.







SINKING PUMPS for COLLIERIES, MINES, Etc.

Fig.191.

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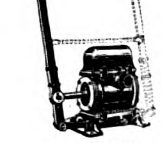

Fig.185.

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The answer, of course, is simple. Pressed steel parts and perfectly designed steel forgings are used instead of heavy castings.

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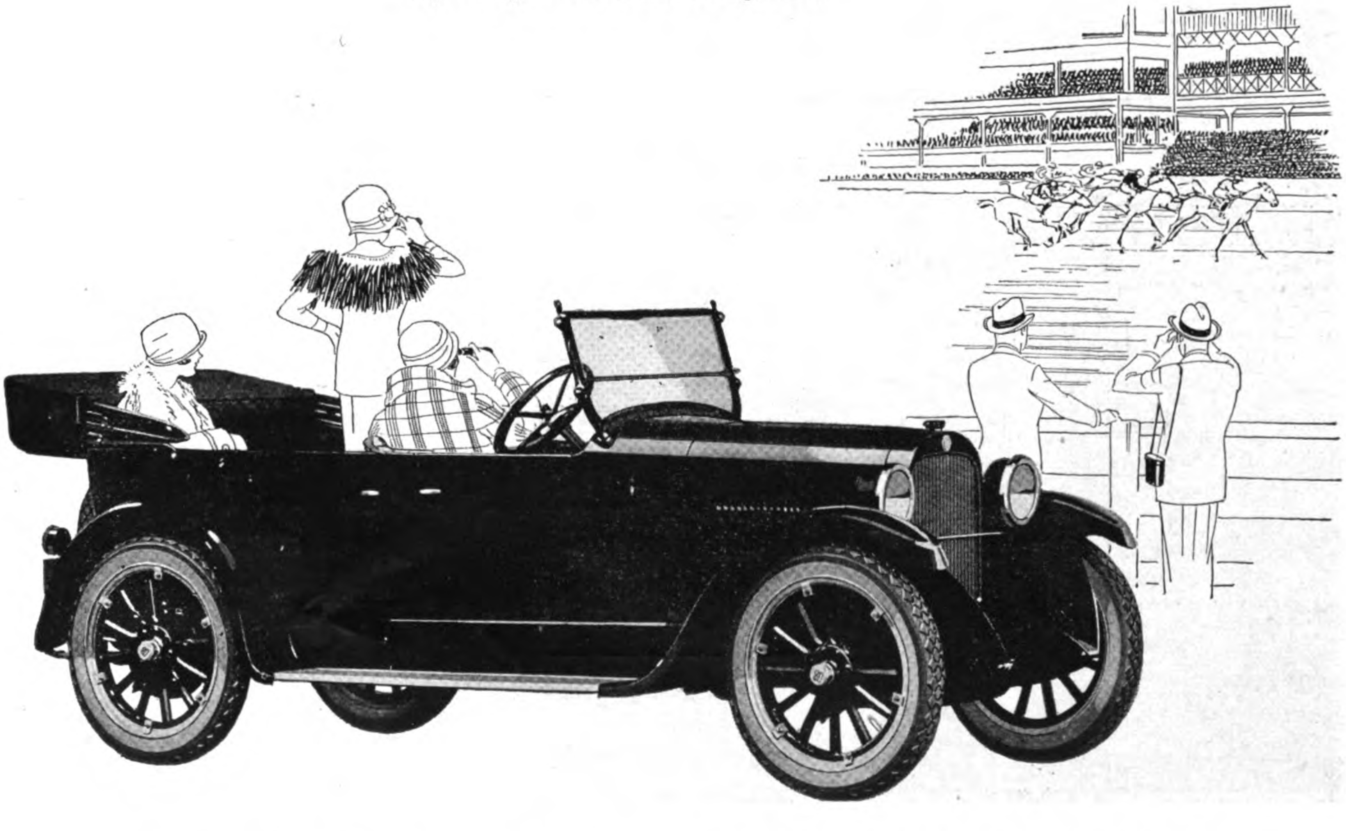

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J. H. Morris, 21 Teido, Seoul, Korea
Japan Automobile Co., Tameike, Akasaka, Tokio
E. W. Frazar & Co., 13 Rue de Paris, Tientsin

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AMOUNTING TO

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AND PLANS TO INCREASE ITS GENERATING PLANT TO A CAPACITY OF

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DO **YOU** THINK

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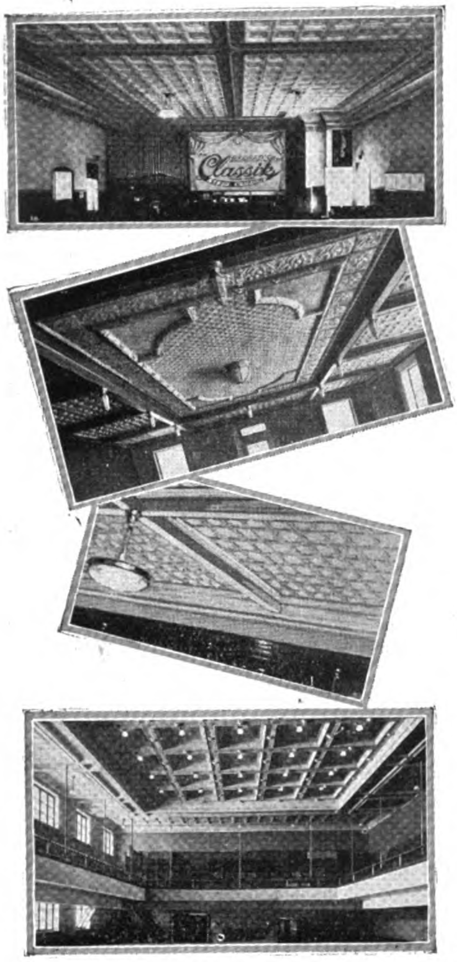

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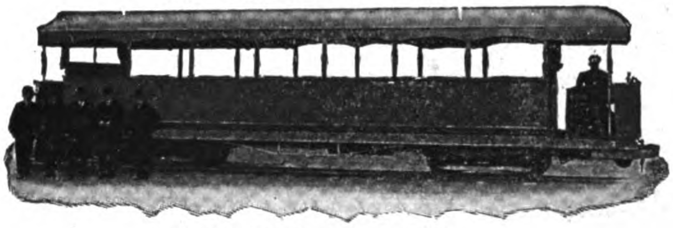

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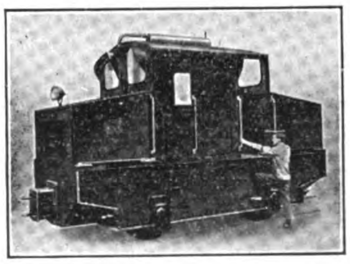

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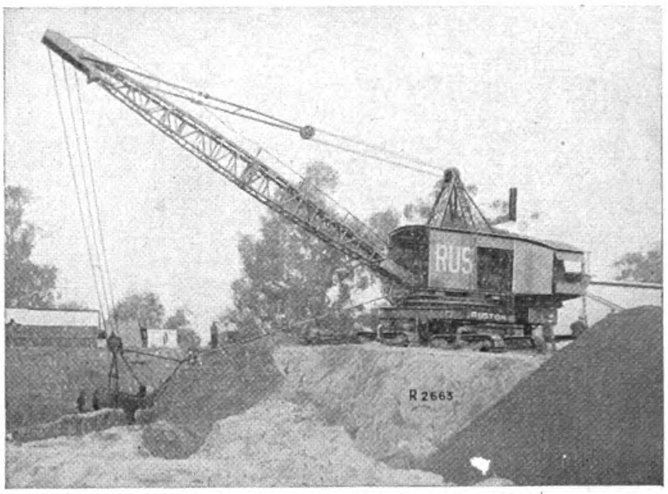
Ruston Draglines



We build a full range of Dragline Excavators for Drainage and Irrigation work of all descriptions. The buckets vary from ½ to 10 cubic yards capacity with jib lengths from 30 to 160 feet.

Canals from 3 feet to 300 feet wide are being excavated by them.

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TRADE MARK

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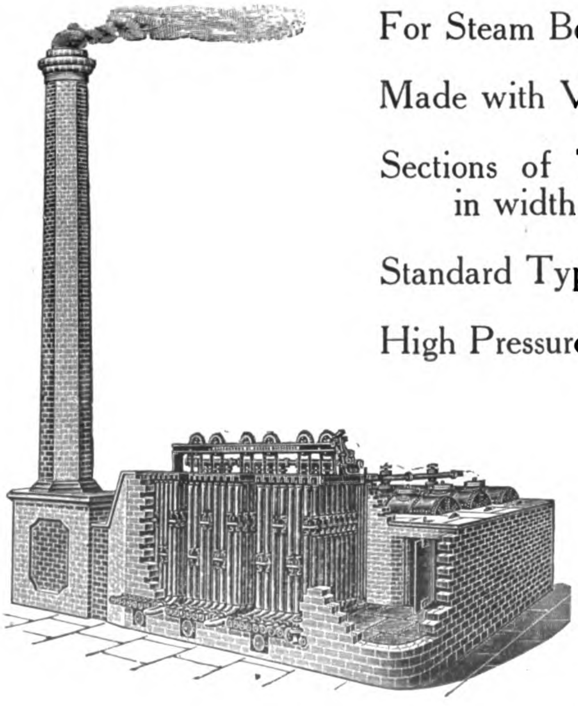
FUEL ECONOMISERS



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High Pressure Type for Boiler pressures up to 350-lbs. per sq. in.

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"VULCAN"

DROP-FORGED

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Tested—Safe

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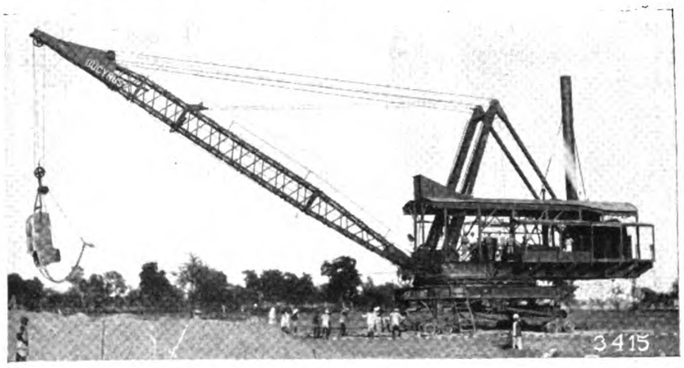
IN INDIA

The unquestioned superiority of Bucyrus Dragline Excavators, has been definitely established on the great Sutlej River Irrigation Project.



Bucyrus Class 24 Dragline Excavator, 85 ft. Boom, $4\frac{1}{2}$ yd. Bucket, in operation on Sutlej River Irrigation Project, India.

Bucyrus Draglines built in all sizes with Buckets from $\frac{1}{2}$ to 6 cu. yds. and Boom 35 to 155 ft. in length.

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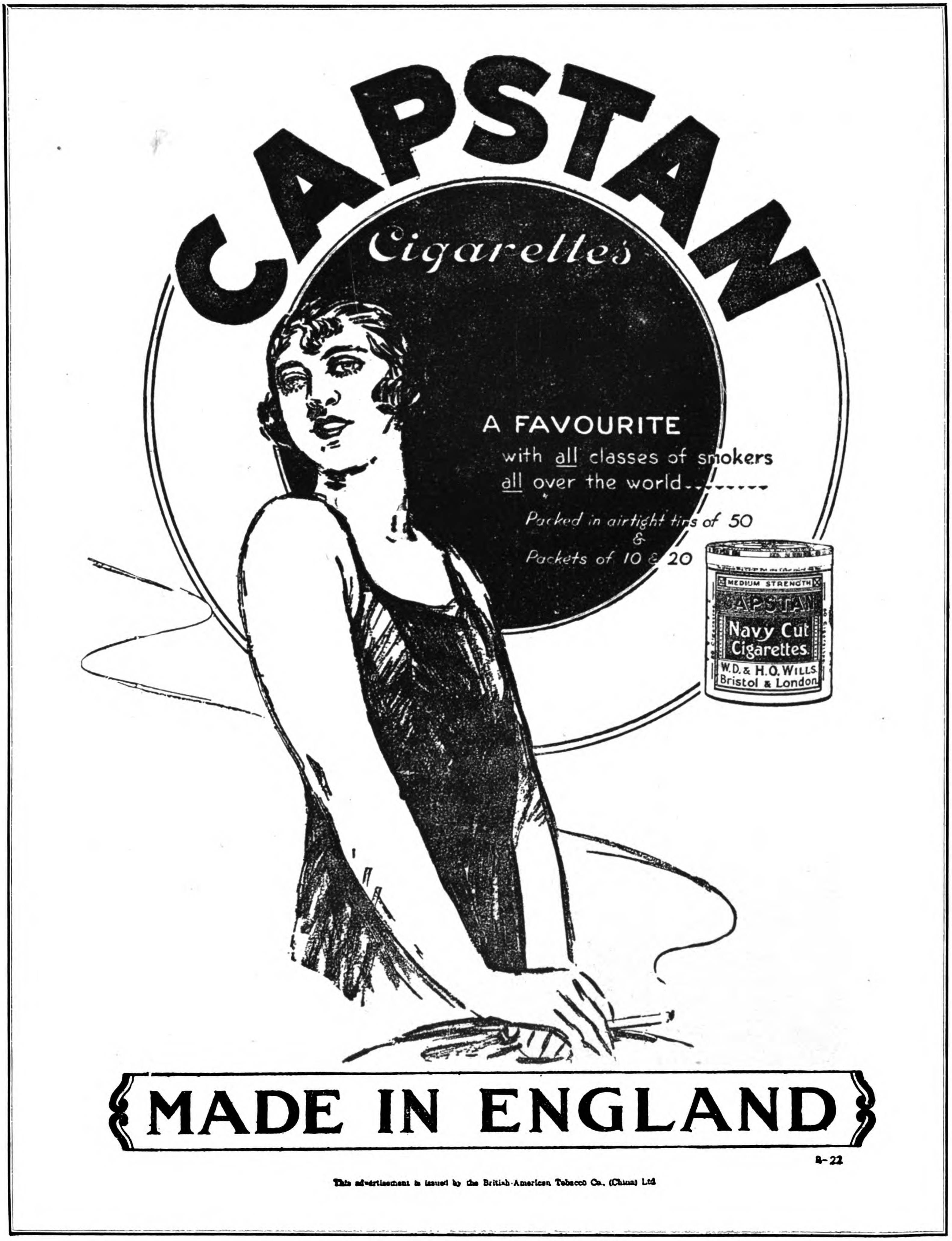
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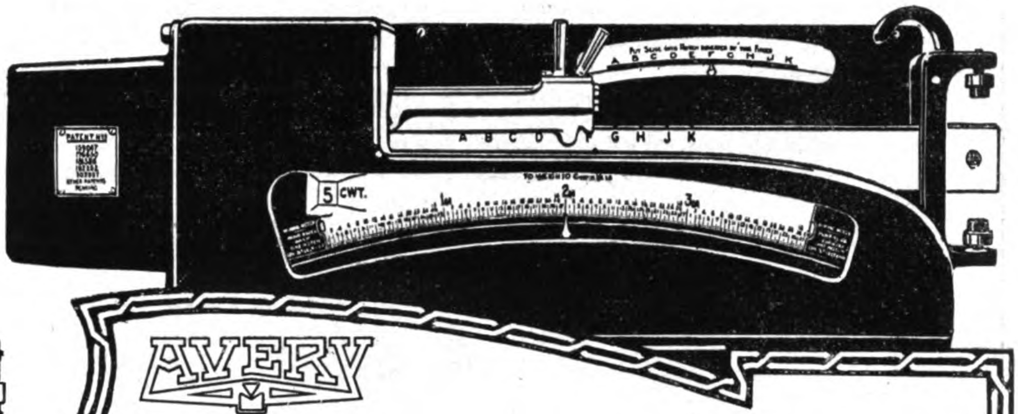

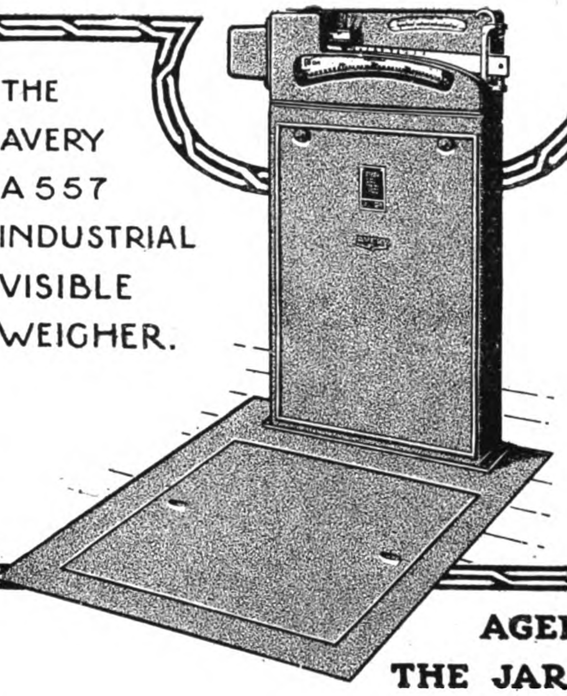

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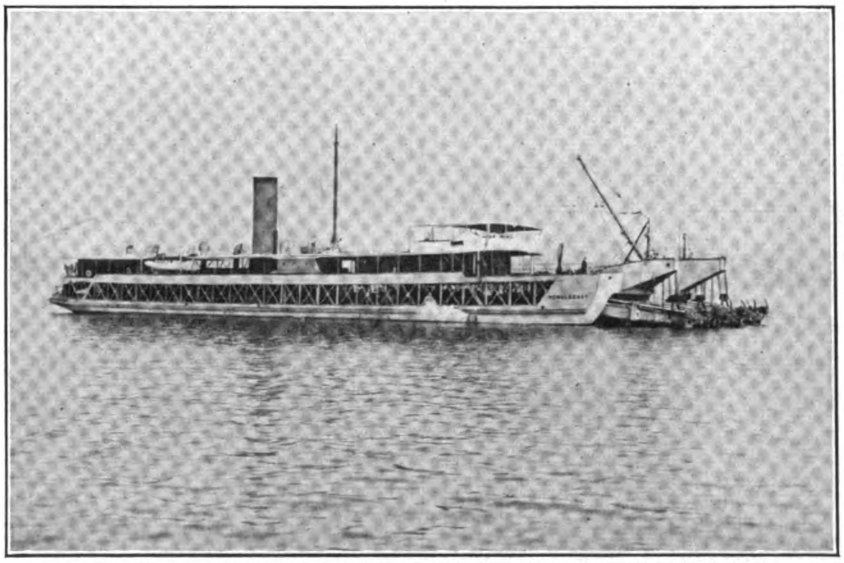

Triple Screw Cutter Suction Discharging Dredgers *Ronaldshay* and *Cowley* Constructed for the Government of India.

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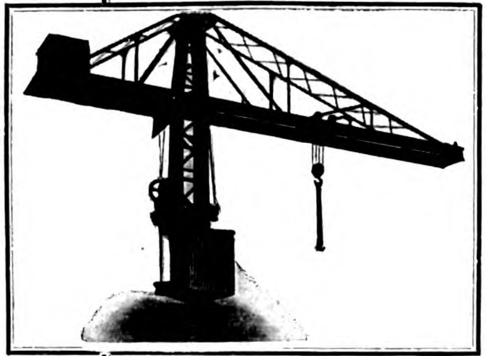

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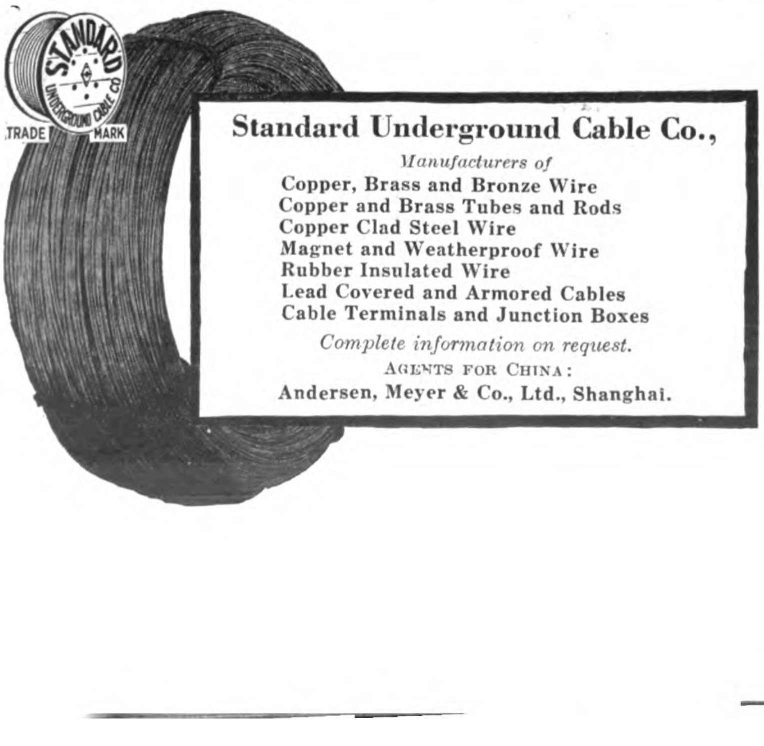

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Manufacturers of

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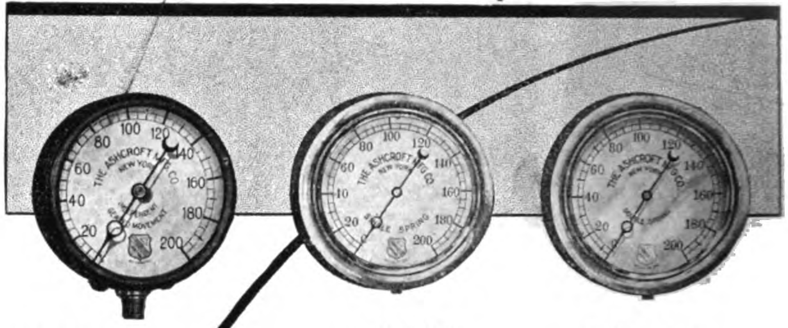
Where there's Pressure



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Single Spring Gauge
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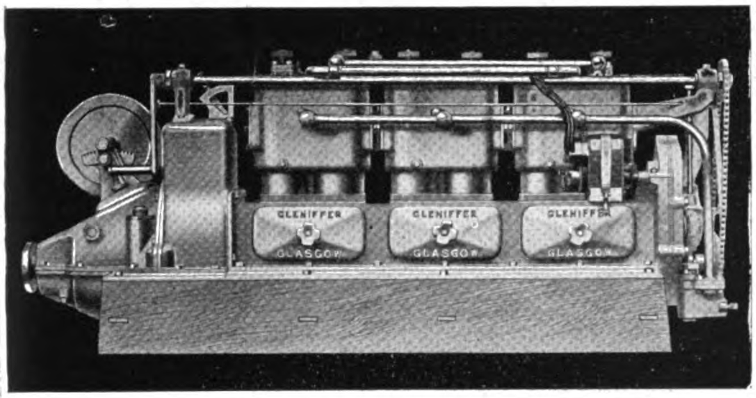

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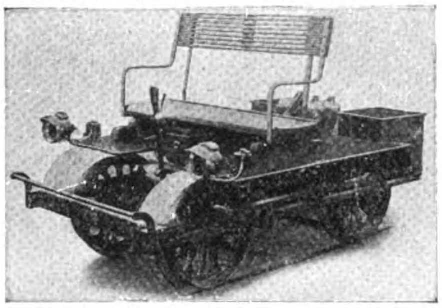

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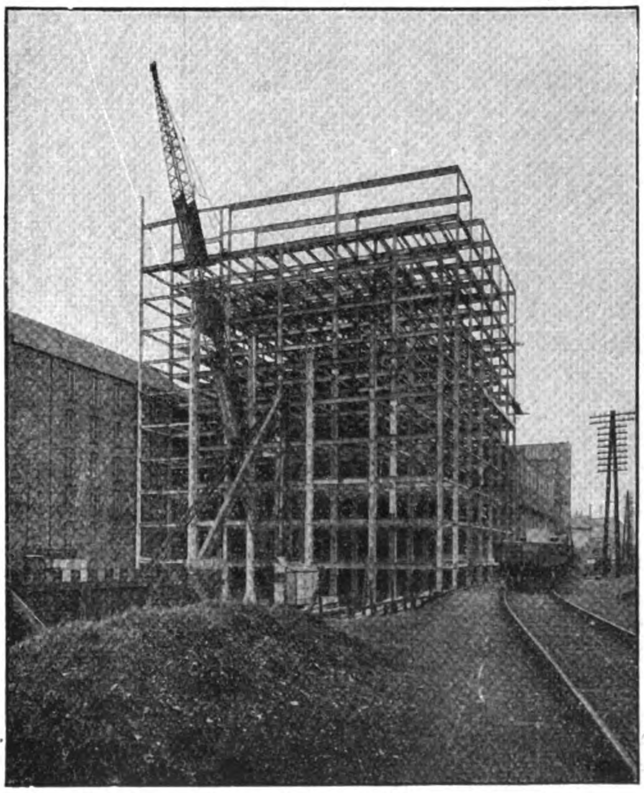

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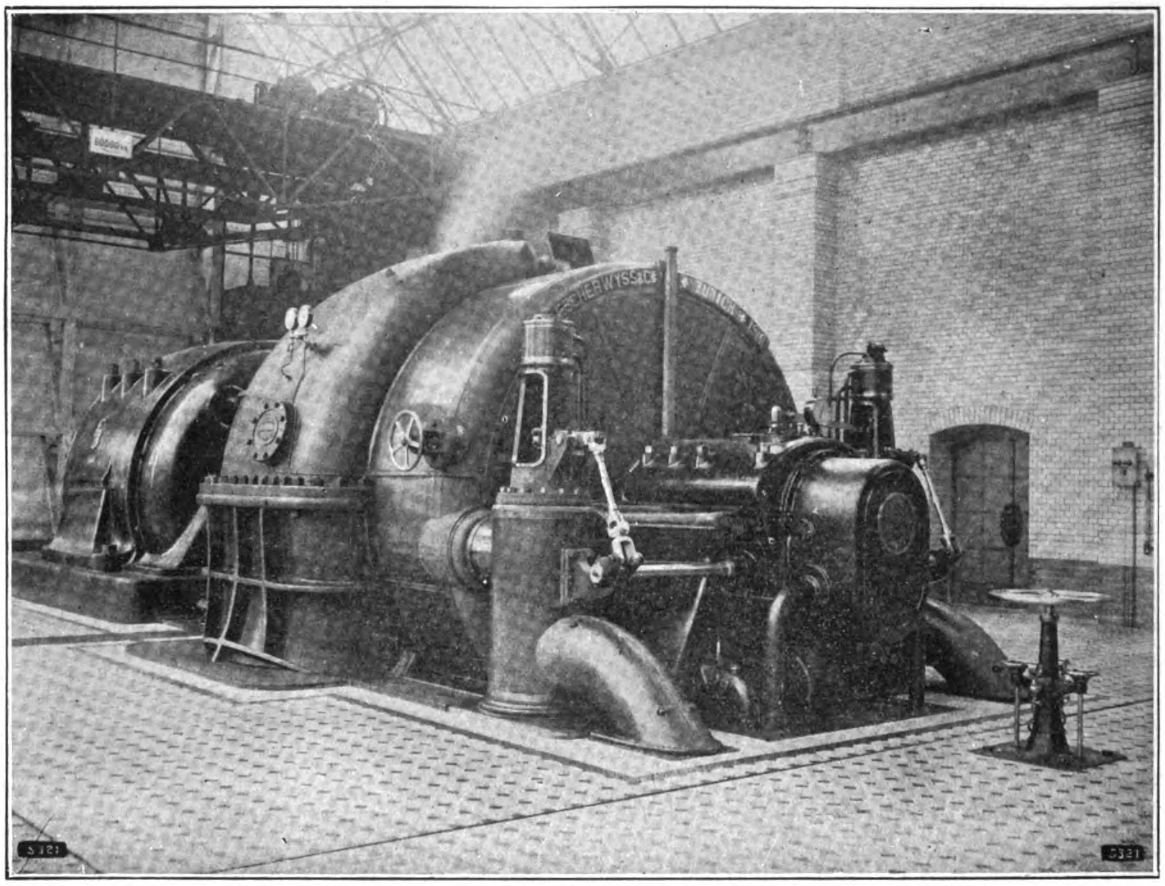

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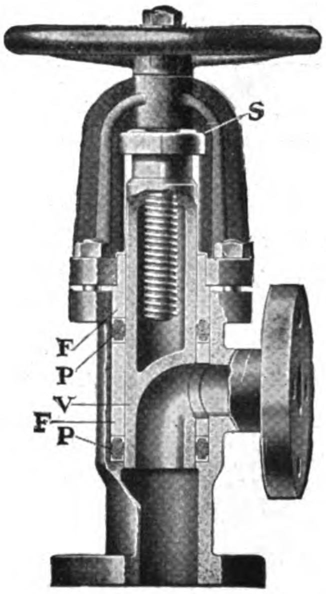
of the worst

Boiler Room Problem
Afloat and Ashore

YARWAY SEATLESS

Blow-off Valves
How It Operates



Yarway Seatless Blow-Off Valve

AFTER valve has closed, shoulder "S" on plunger "V" engages the loose follower gland "F." A hard turn of handwheel then compresses packing "P" above and below the port, making an absolutely tight valve. Set-screw "N" prevents turning of gland when handwheel is turned.

SIMPLICITY

First: Merely turn the handwheel, which operates plunger "V." Full, unrestricted area through port when blowing down boiler.

PROTECTED PACKING

Second: Plunger "V" fits so perfectly into valve body that very little packing, "P," is required, but what is used is placed in the sleeve or follower gland "F," where it is always protected, whether the valve is wide open, closed, or partly closed. This protected packing will last indefinitely.

AUTOMATICALLY PACKED

Third: After valve has closed, a hard turn of handwheel compresses packing "P" in the follower gland "F," making the valve absolutely tight. This is a feature that cannot be obtained in any other blow-off valve.

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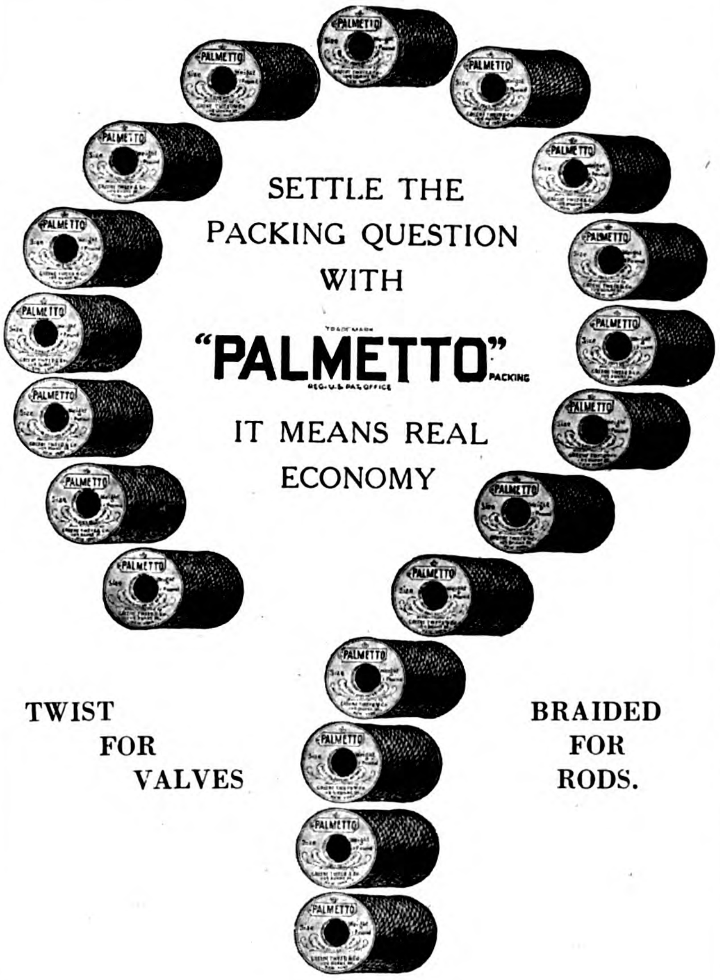

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BRAIDED FOR RODS.

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thus warranting first class make, favourable prices, stock supply

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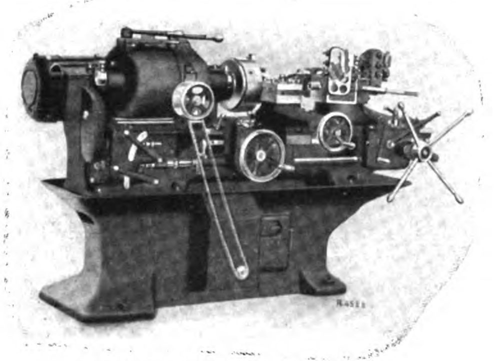

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7 Models
For bar work 7/16"—2 3/8",
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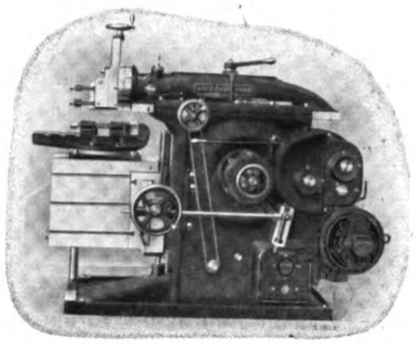

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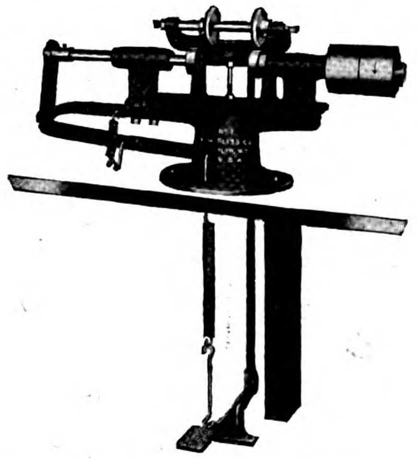
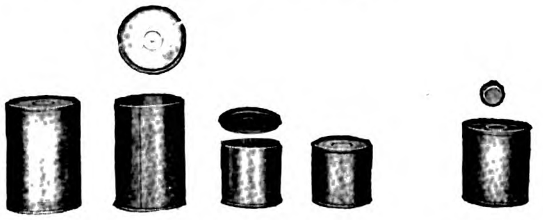
4 Models
From 7 7/8" up to 22"
stroke of ram

One of The Many Types of Tin Containers Made in Bliss Machinery



Bliss No. 1 Horizontal Double End Crimper. This machine will attach simultaneously the tops and bottoms to can bodies.



We build complete lines of machines for the manufacture of condensed and evaporated milk cans as illustrated above. Automatic machines for large plants and semi-automatic machines for plants of medium capacity.

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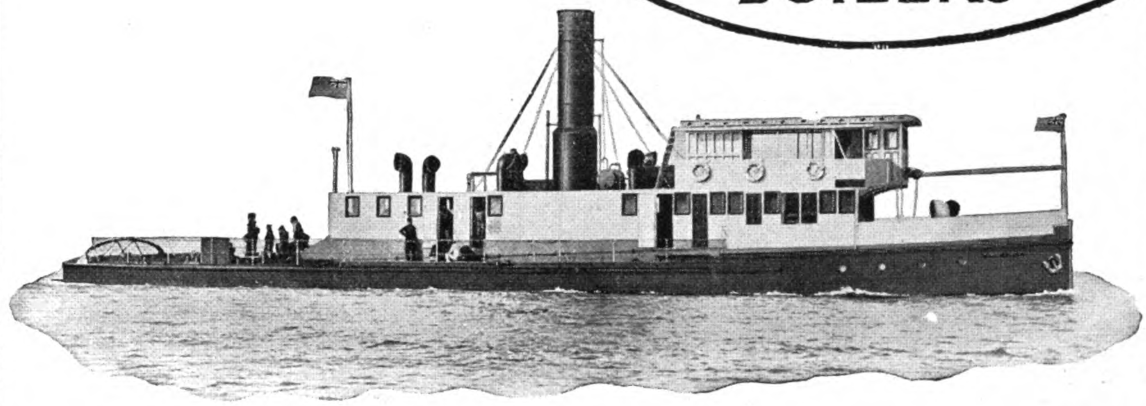
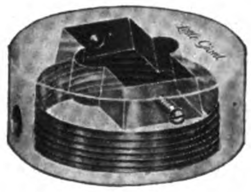


Little Giant Screw Plates

Collet Complete



Cap

Guide

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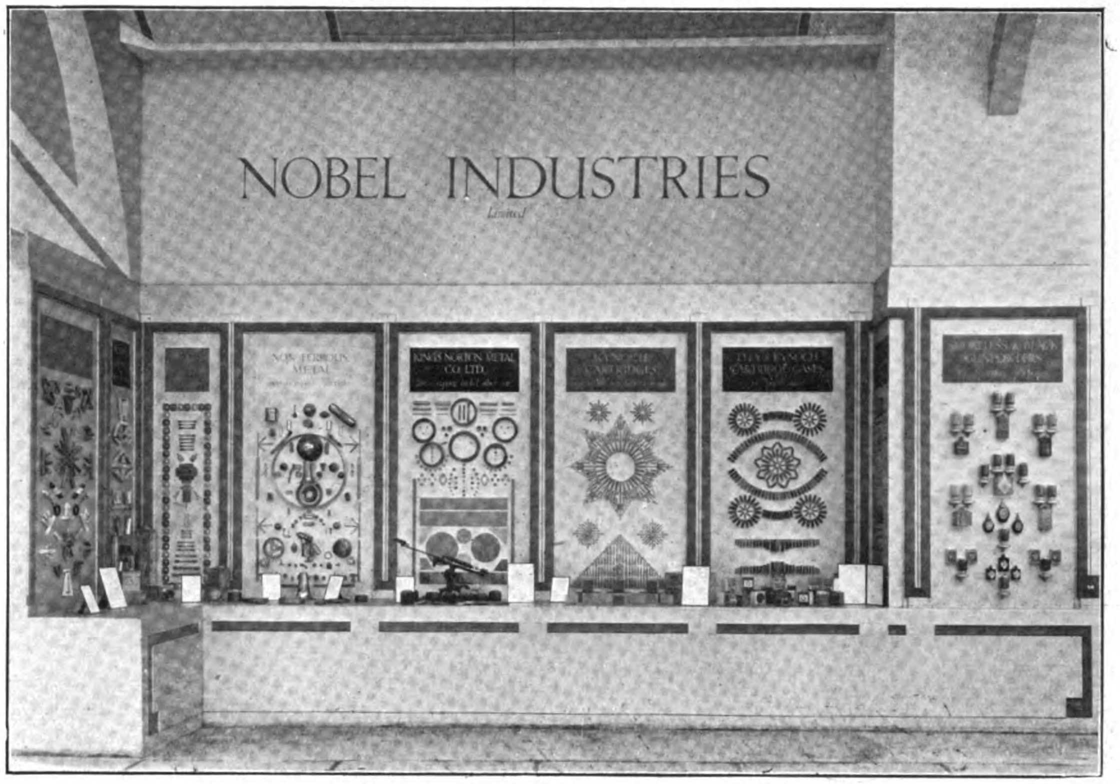

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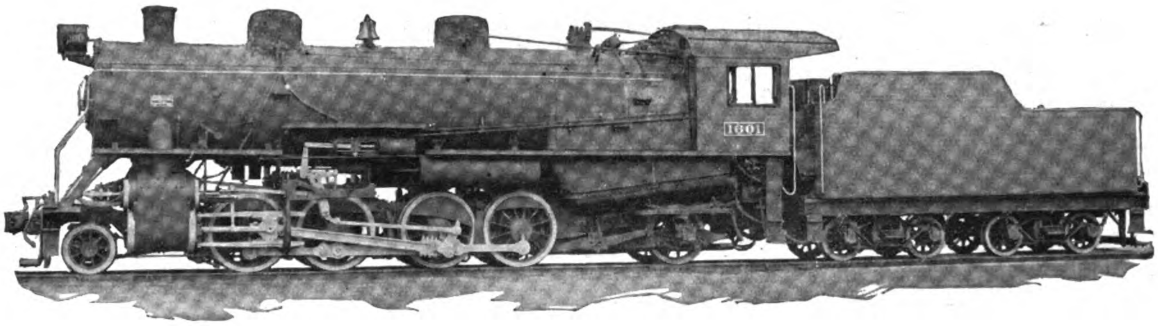

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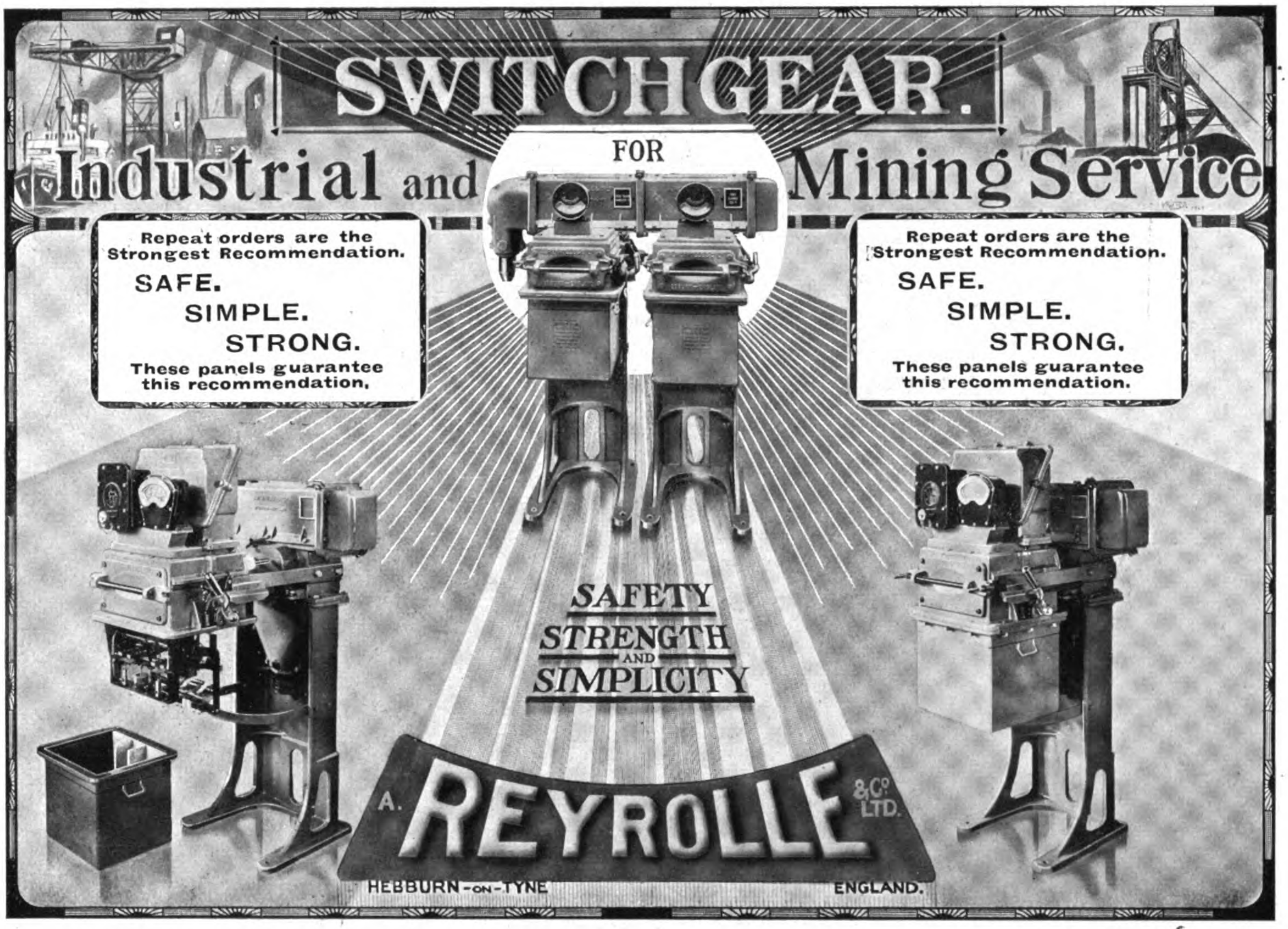

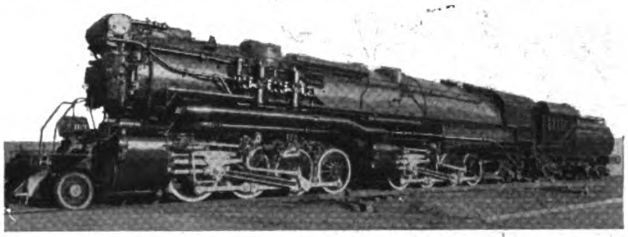

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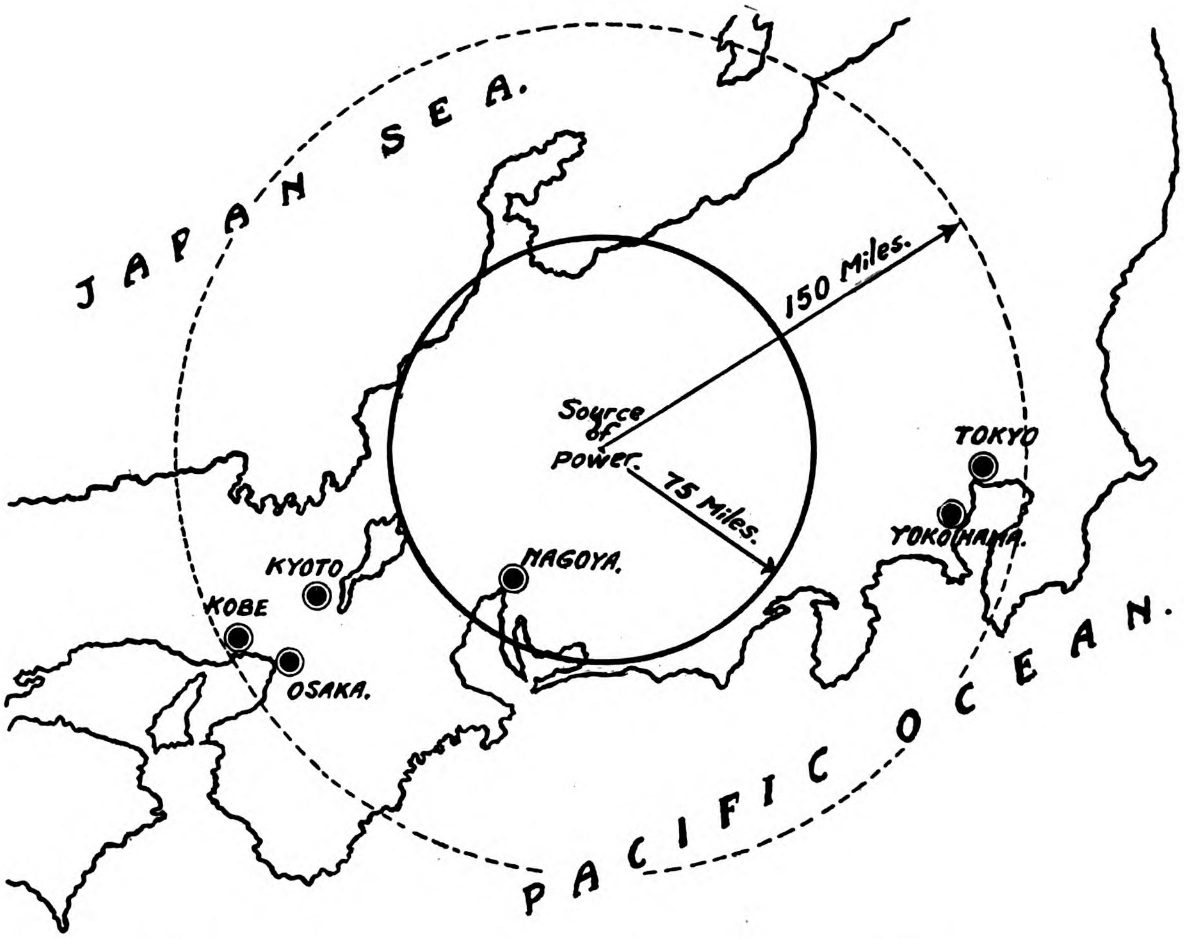

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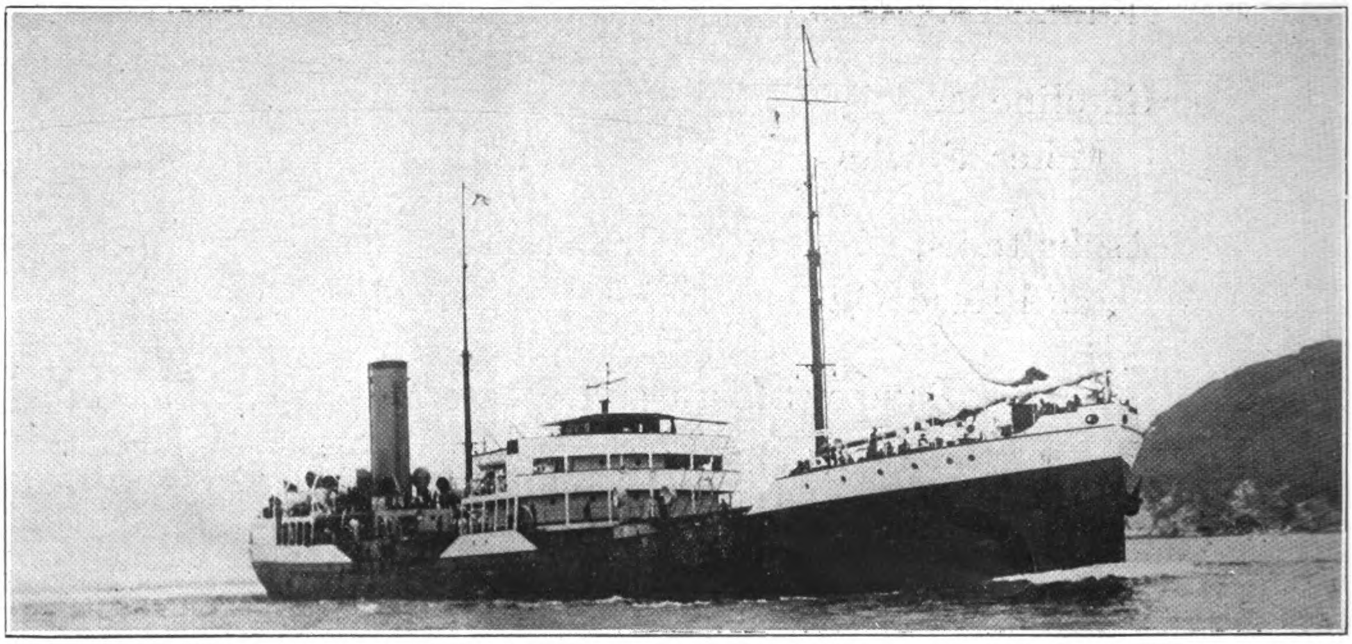

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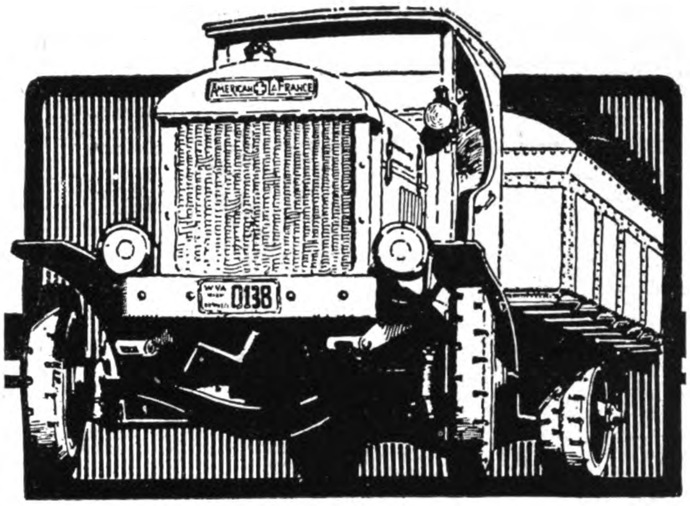

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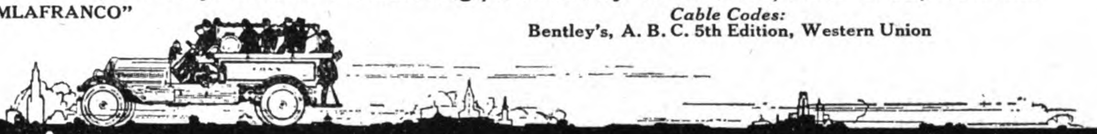

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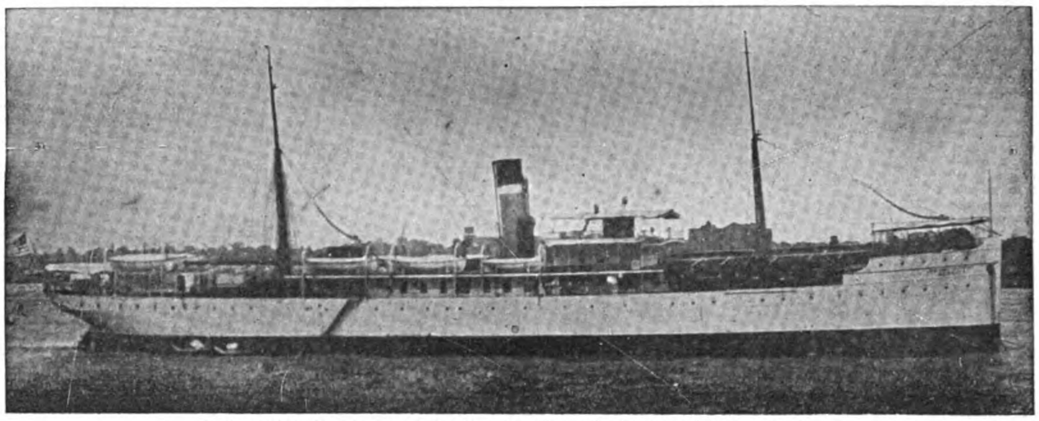

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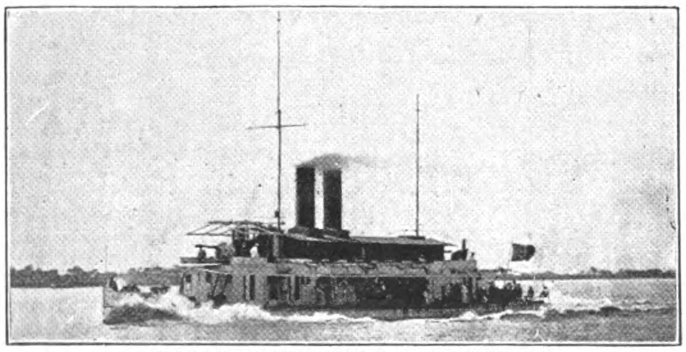

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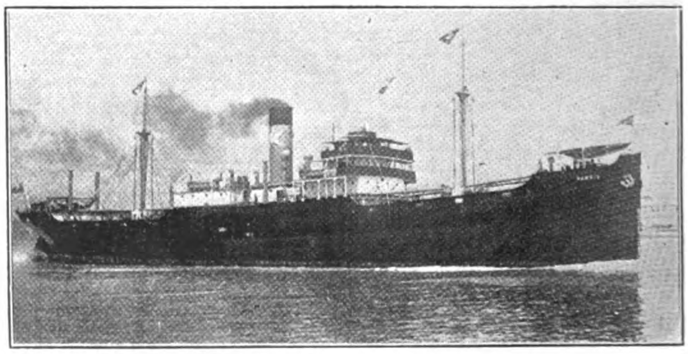

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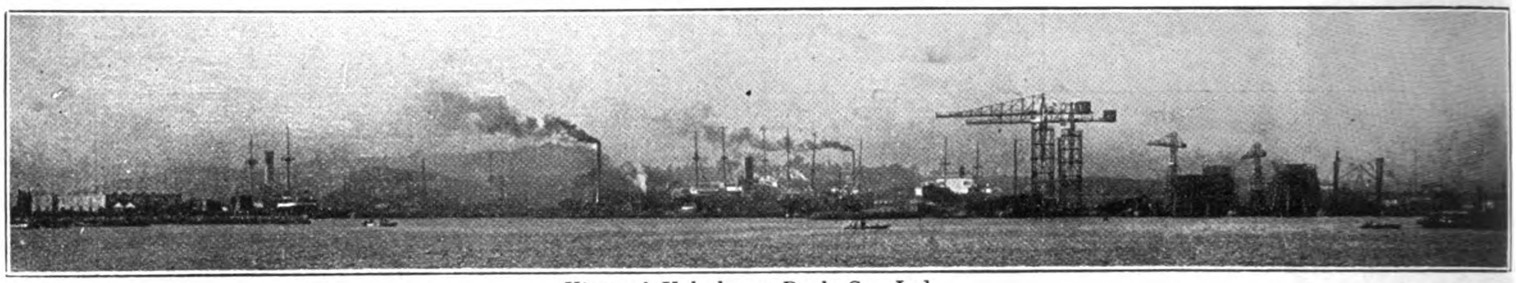

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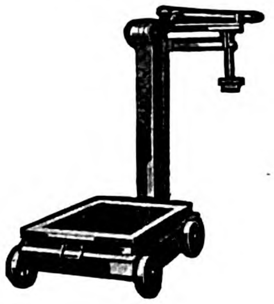

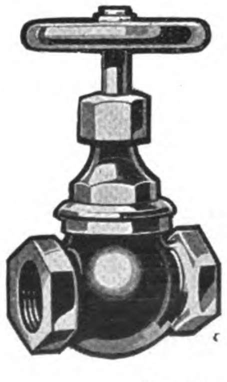

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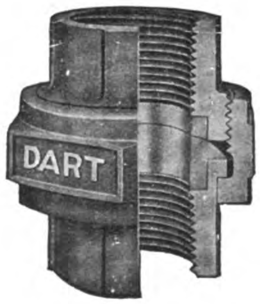

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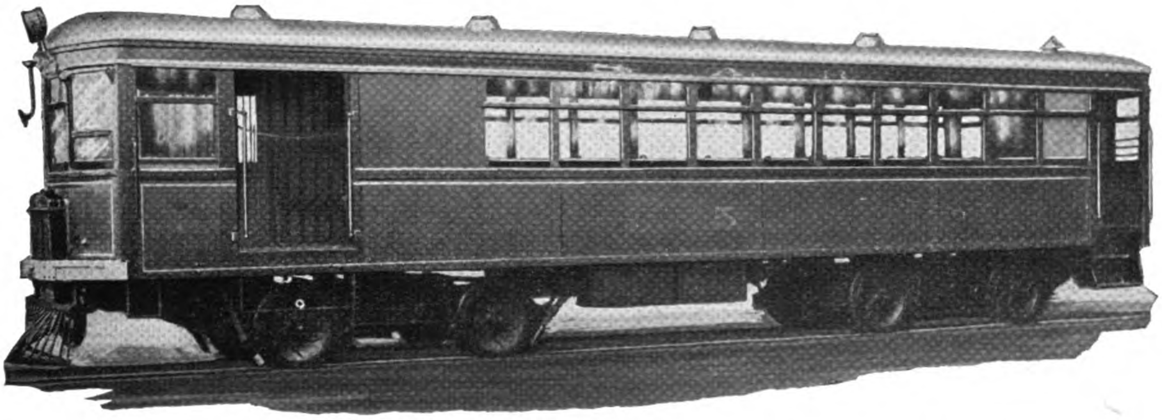

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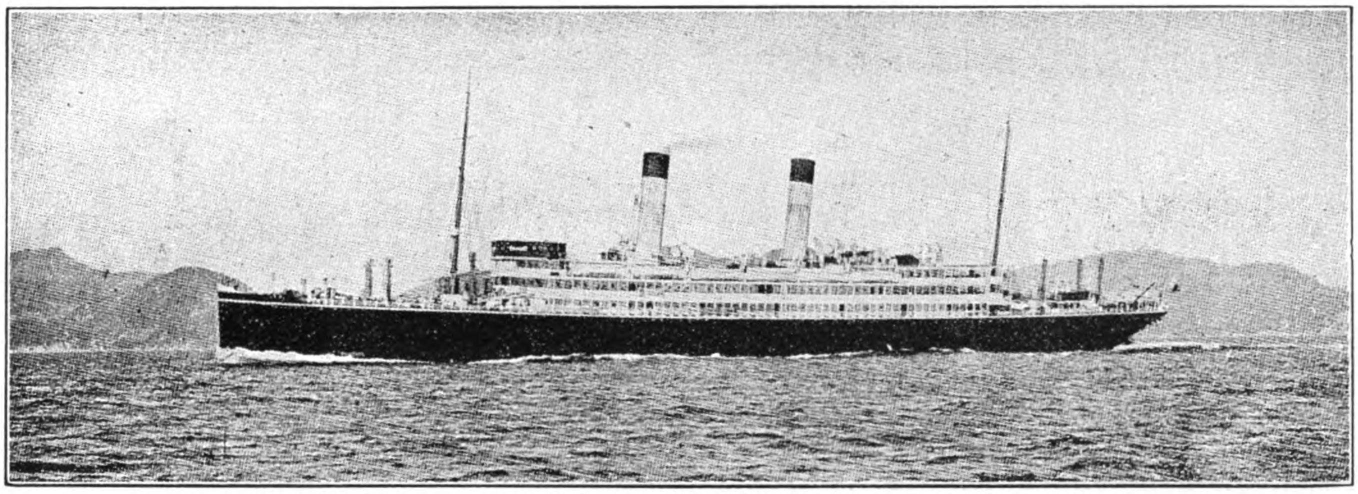

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Width of Entrance on Top - -	89	,,
,, ,, ,, ,, Bottom-	77	,,
Water on Blocks at Spring Tide	26½	,,

DOCK No. 2

Extreme Length - - - - - -	371	Ft.
Length on Blocks - - - - - -	350	,,
Width of Entrance on Top - - -	66	,,
,, ,, ,, ,, Bottom -	53	,,
Water on Blocks at Spring Tide -	24	,,

DOCK No. 3

Extreme Length - - - - - -	728.9	Ft.
Length on Blocks - - - - -	714	,,
Width of Entrance on Top - -	99½	,,
,, ,, ,, ,, Bottom -	88½	,,
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CAPITAL (PAID UP) - Yen 5,000,000; RESERVE FUND - Yen 4,768,000

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Directors: K. HAYASHI and K. FUKUI
Auditors: E. KOSHI and T. MAJIMA

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OSAKA—Nakanoshima, Nishi, Utsubo, Aji-kawa, Nishinari, Sakurashima Chikuko
YOKOHAMA—Shinko-cho
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KOBE—Kano-cho
MOJI—Hama-cho
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„ Jackson	Feb. 6	Feb. 22
„ Jefferson	Feb. 18	Mar. 6

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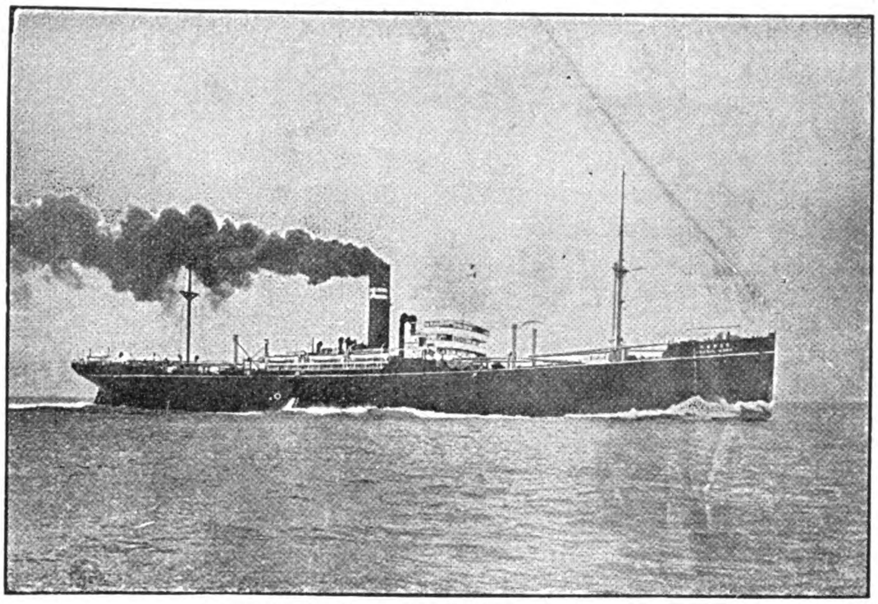

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JAPAN-BOMBAY LINE:—Fortnightly—Ports of Call: Yokohama, Yokkaichi, Osaka, Kobe, Moji, Hongkong, Singapore, Colombo and Bombay.

HONGKONG-PUGET SOUND LINE:—Fortnightly—Ports of Call: Hongkong, Manila, Keelung, Shanghai, Nagasaki, Kobe, Yokkaichi, Shimizu, Yokohama, Victoria, Seattle, Tacoma and Vancouver.

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OSAKA—Tientsin Line.—6 Sailings per month.
OSAKA—Tsingtau Line.—2 Sailings per month.
YOKOHAMA—Dairen-Tientsin Line.—About 8 Sailings per month.
TAKAO—Tientsin Line.—2 Sailings per month.
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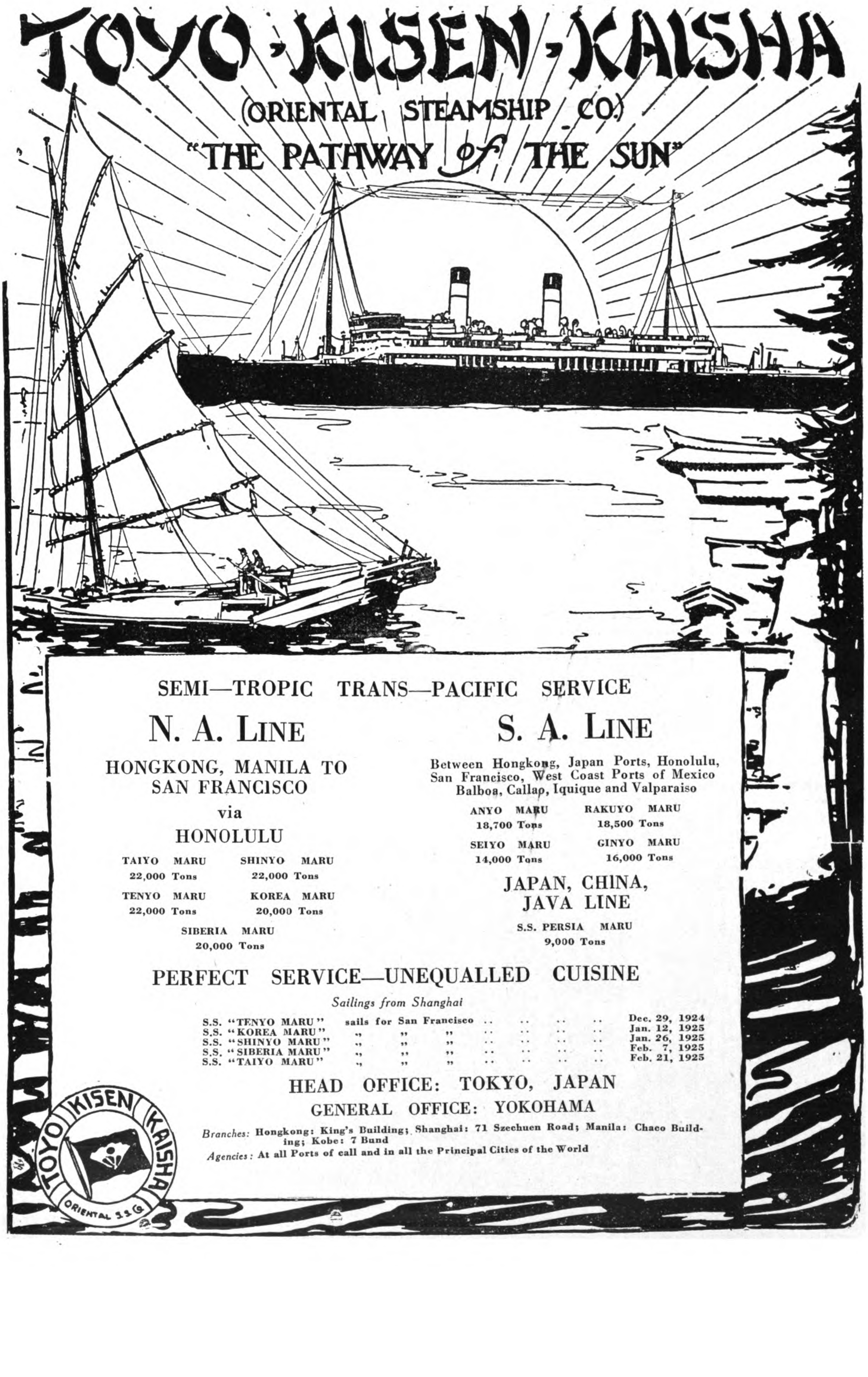
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Standard Marine Insurance Co., Ltd.

Royal Exchange Assurance Corporation.

Sea Insurance Co., Ltd.

Guardian Assurance Co., Ltd.

KOKUSAI KISEN KAISHA

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Paid-up Capital - -	„ 87,500,000.00
Aggregate Tonnage - -	500,000 Tons

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Name	Tons D.W.	Name	Tons D.W.
Rozan-Maru	8,700	Capetown-Maru	9,100
Vancouver-Maru	9,100	Suez-Maru	6,600
Boston-Maru	8,800	Daio-Maru	9,000
Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
Hankow-Maru	6,400	Taisan-Maru	5,000
Yoni-Maru	11,000	Yuri-Maru	11,000
Taibu-Maru	8,900	Texas-Maru	11,000
San Francisco-Maru	9,100	Tamatsu-Maru	6,600
Naple-Maru	9,100	Eifuku-Maru	9,100
Glasgow-Maru	9,100	Kifuku-Maru	9,100
Yayoi-Maru	8,700	Toyofuku-Maru	9,000
Yaye-Maru	11,000	Raifuku-Maru	9,100
Malta-Maru	8,700	Keifuku-Maru	9,100
Buyo-Maru	8,800	Washington-Maru	9,100
Brazil-Maru	9,100	Tokufuku-Maru	9,100
Kofuku-Maru	9,100	Portland-Maru	9,100
Yezari-Maru	6,900	England-Maru	9,100
Yugao-Maru	5,000	Chili-Maru	9,100
Yubaye-Maru	5,000	Argentine-Maru	9,100
Sydney-Maru	6,400	Port Said-Maru	9,100
Shanghai-Maru	6,400	New York-Maru	9,100
Singapore-Maru	9,100	Karorin-Maru	6,400
Jyufuku-Maru	9,100	Tasmania-Maru	6,400
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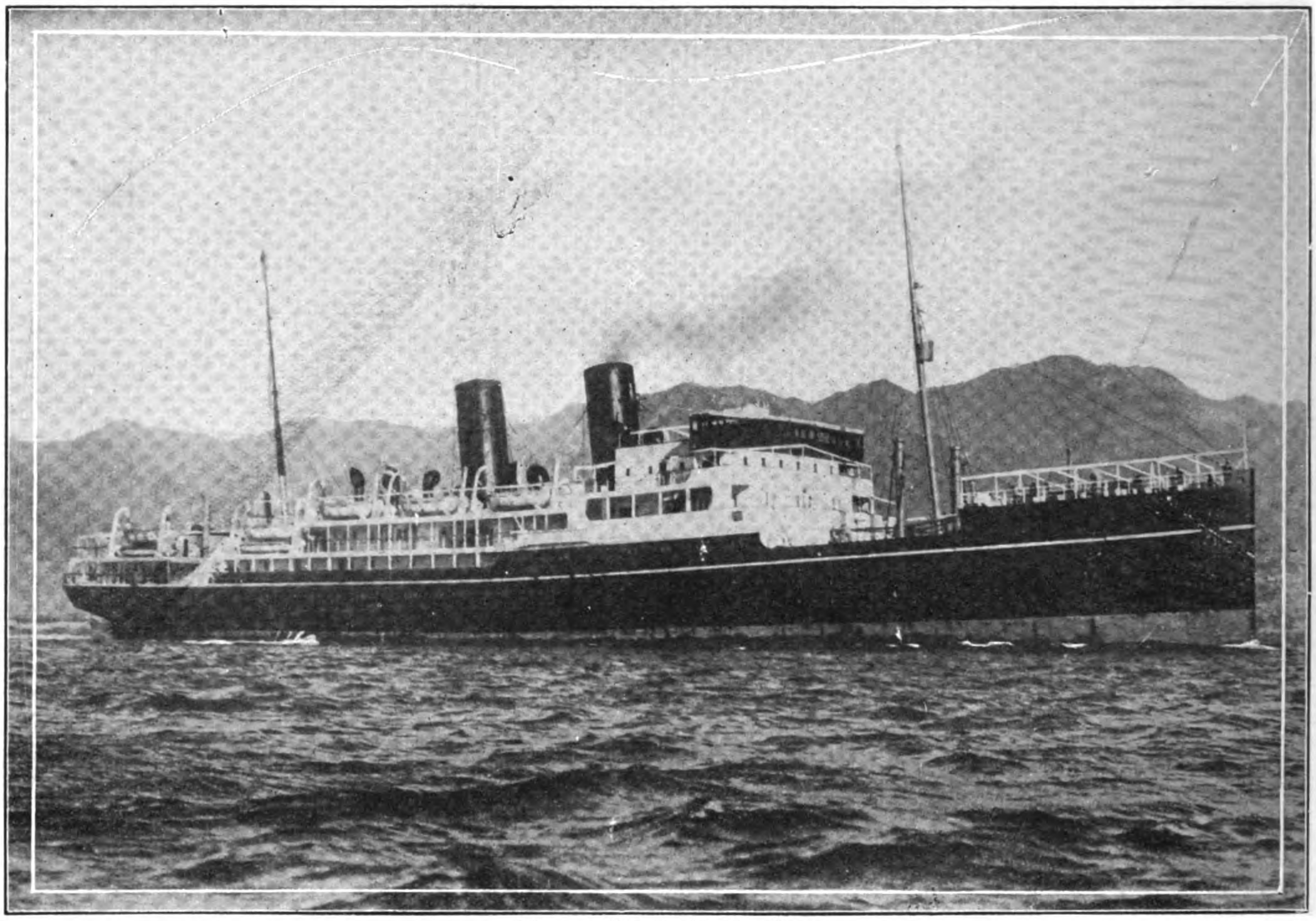

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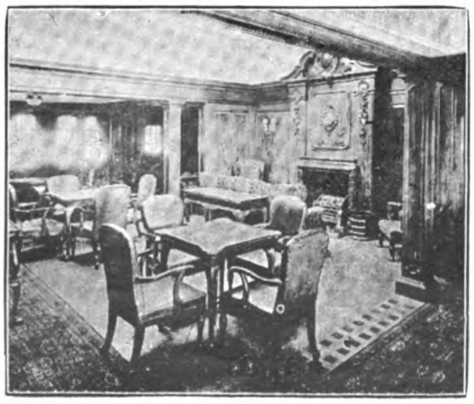

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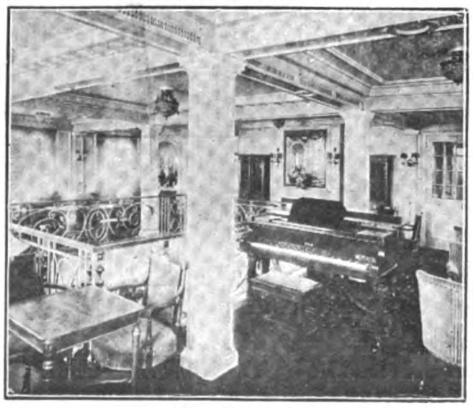
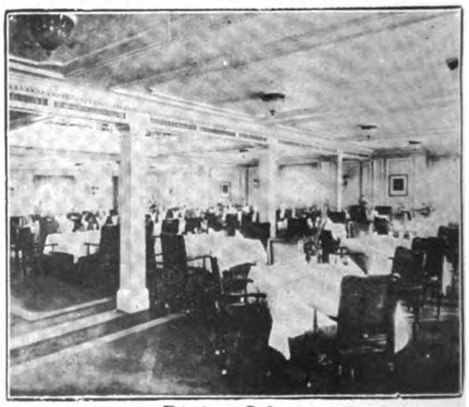


Social Hall



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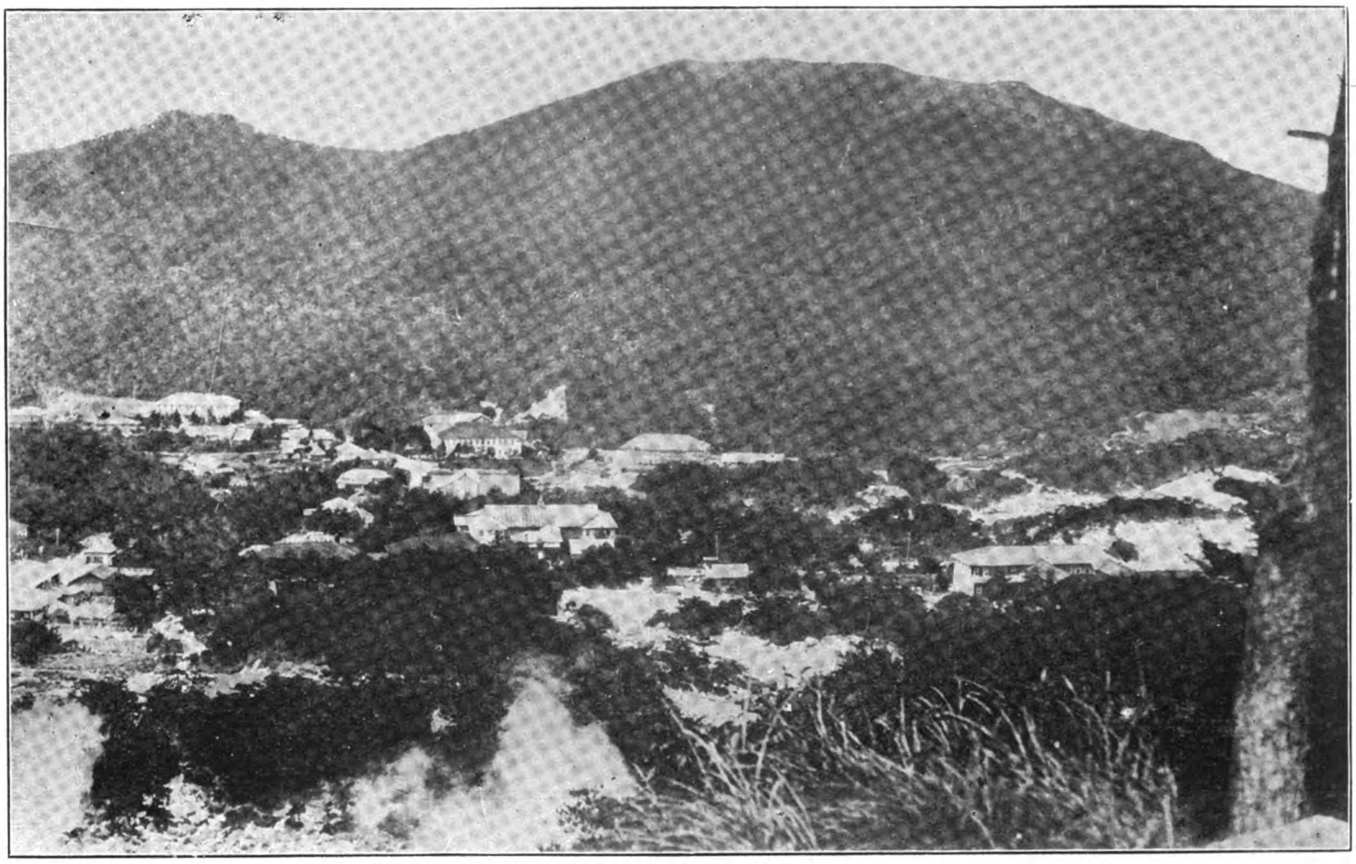

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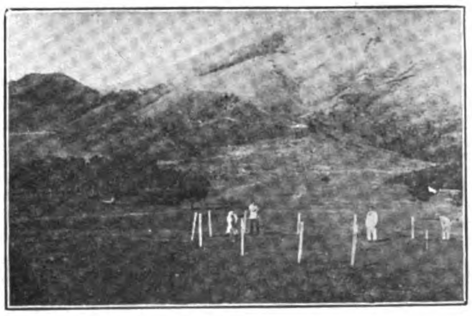

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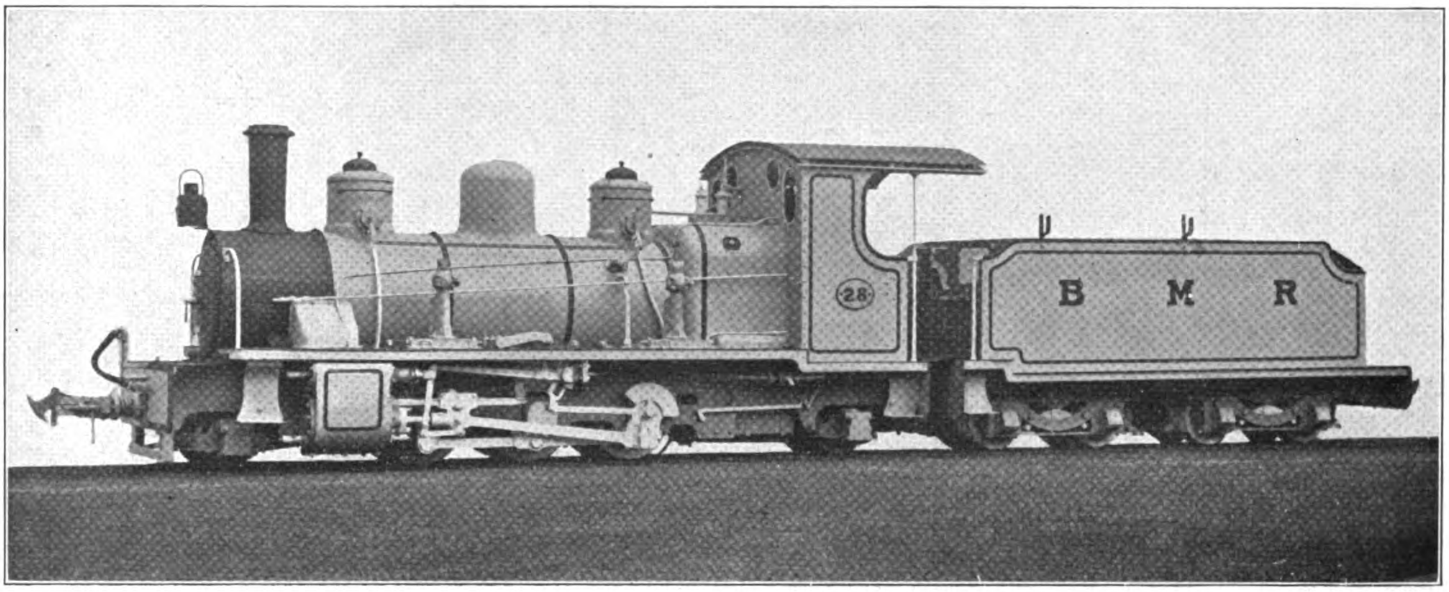

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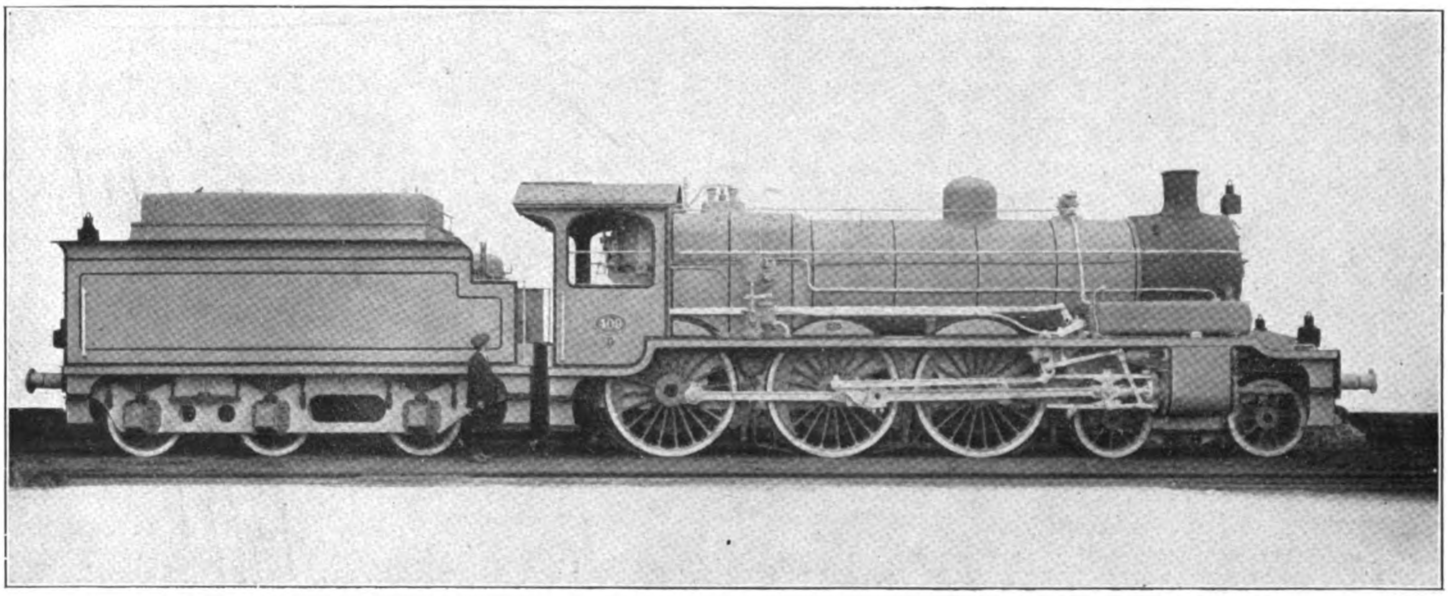

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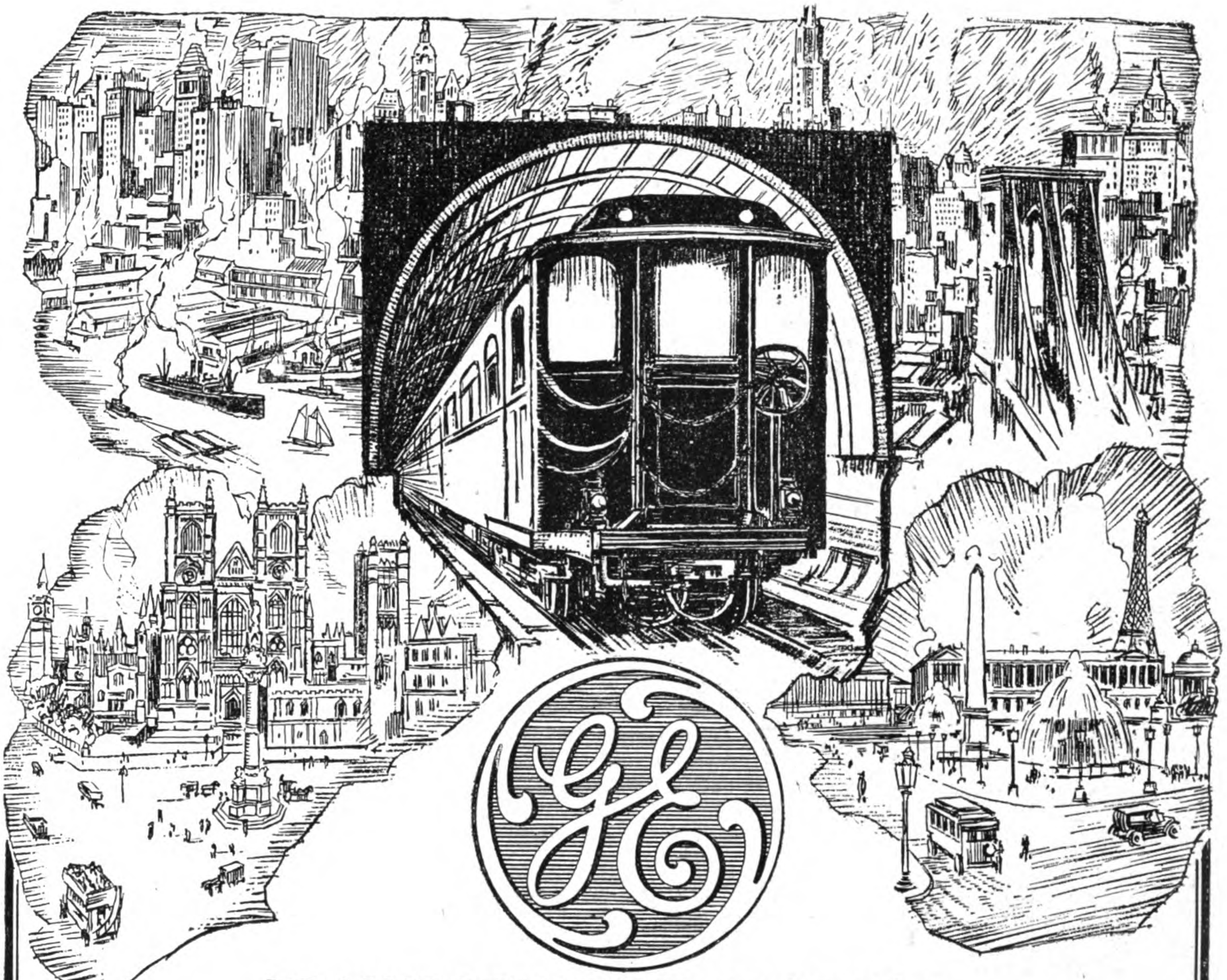

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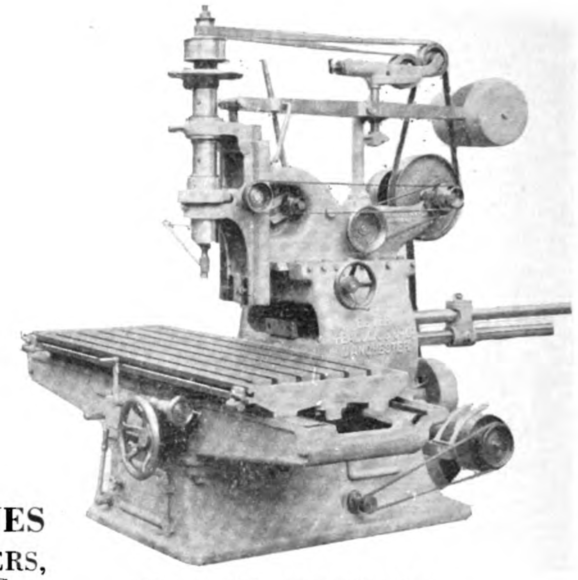

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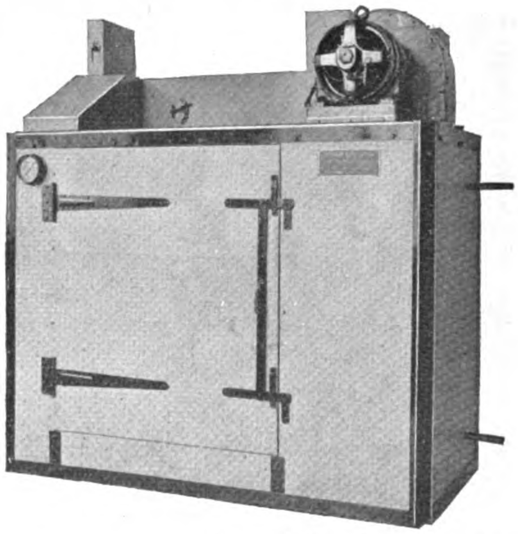

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I. Iuchi, Esq. T. Kakiuchi, Esq.

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CAPITAL PAID-UP - - - Yen 30,000,000

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Capital Paid-Up..................Y. 60,000,000.00
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CAPITAL PAID-UP - - - - -	Yen 17,500,000
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Capital Paid-up	Y. 52,500,000
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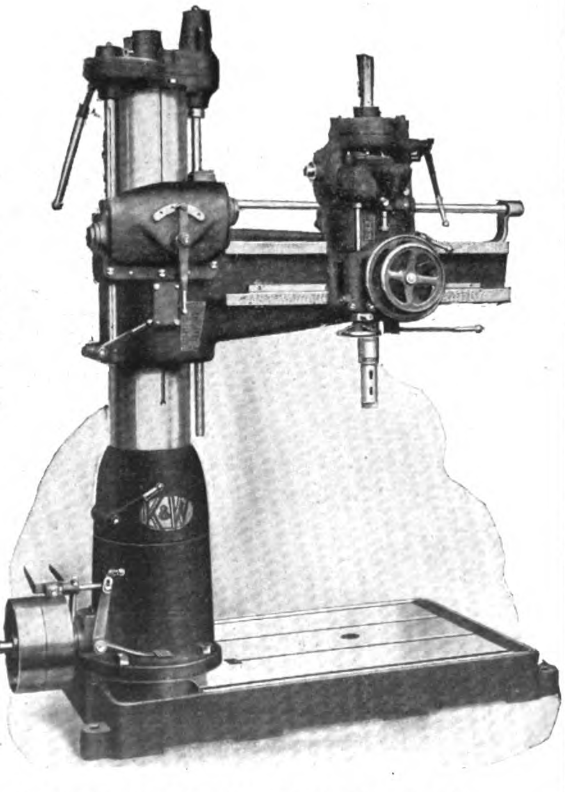

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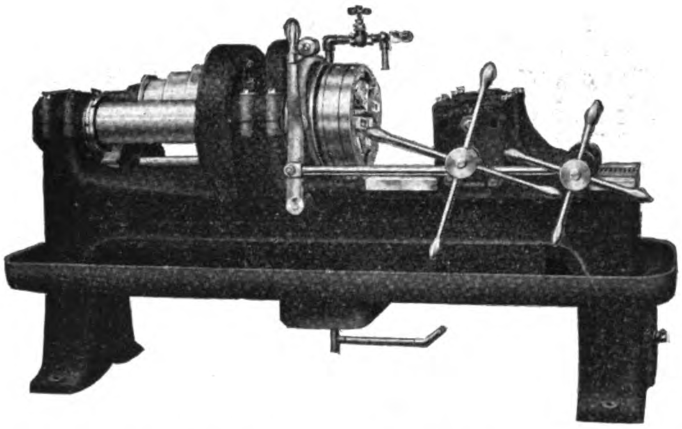
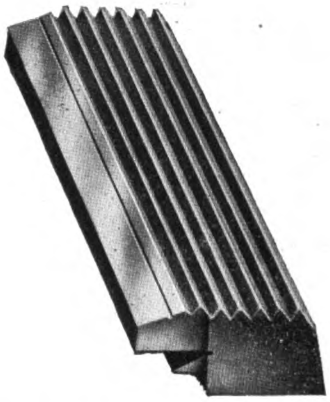
Heap's Patent Screwing Machines with Tangential Dies





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JOSHUA HEAP & CO., LTD.

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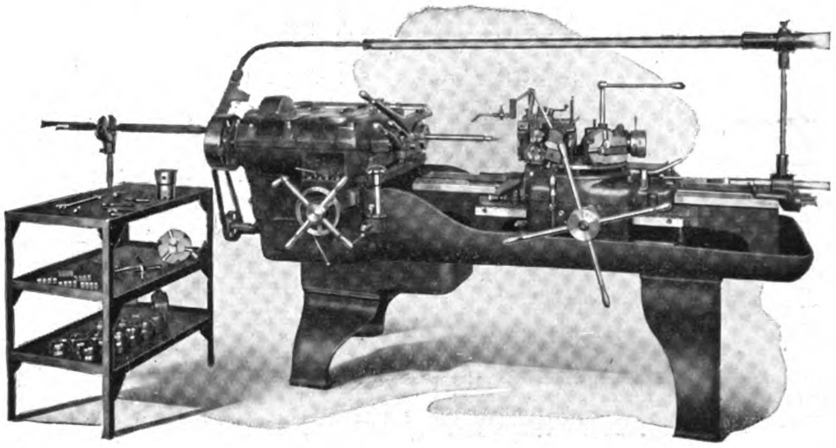

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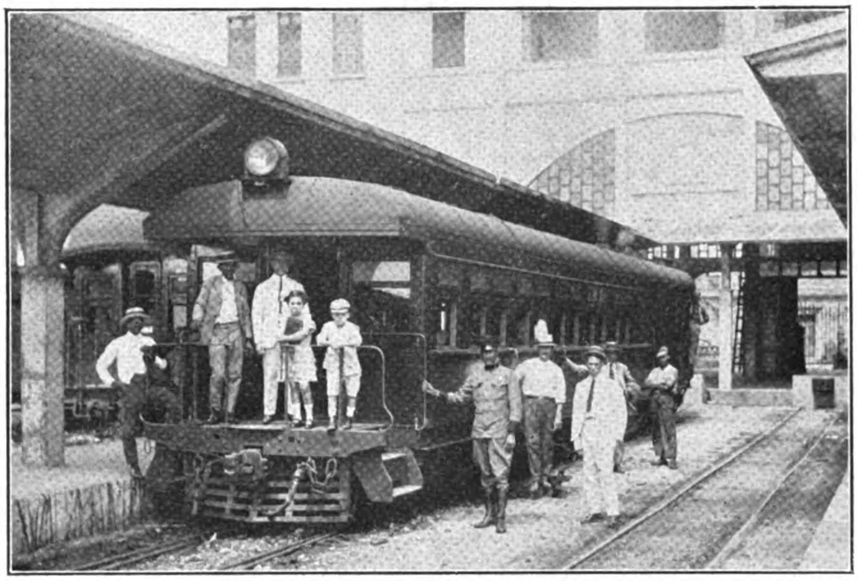

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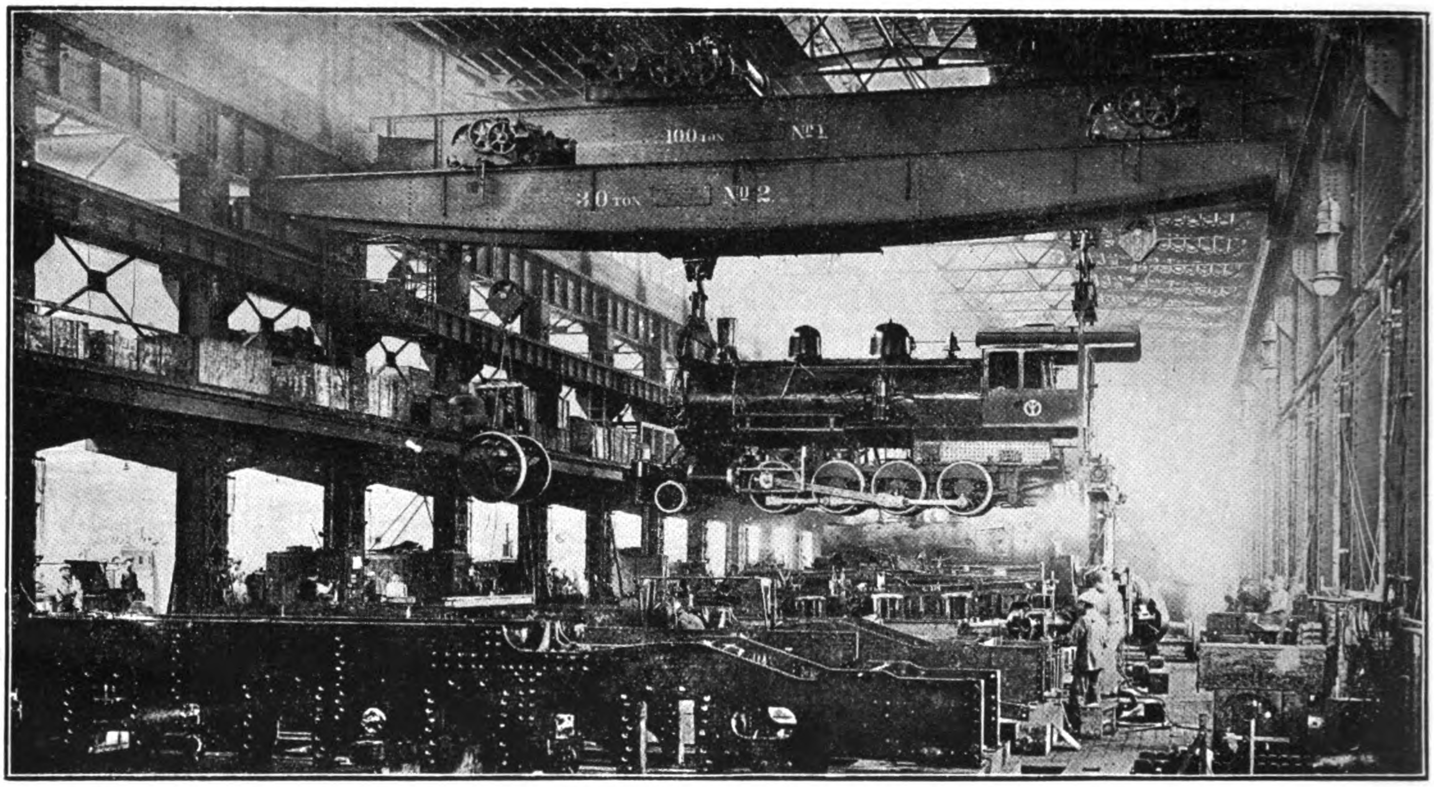

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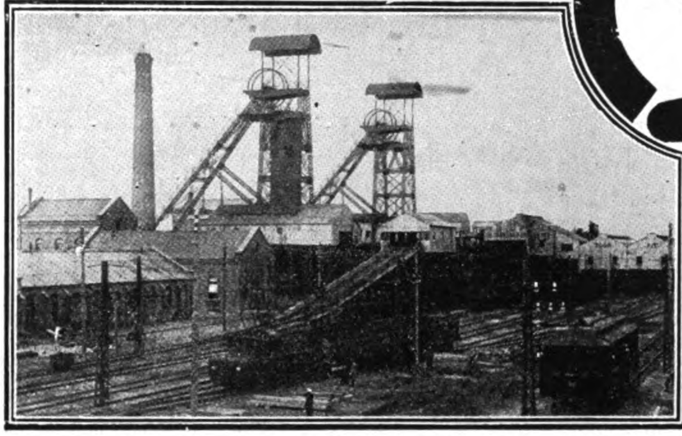

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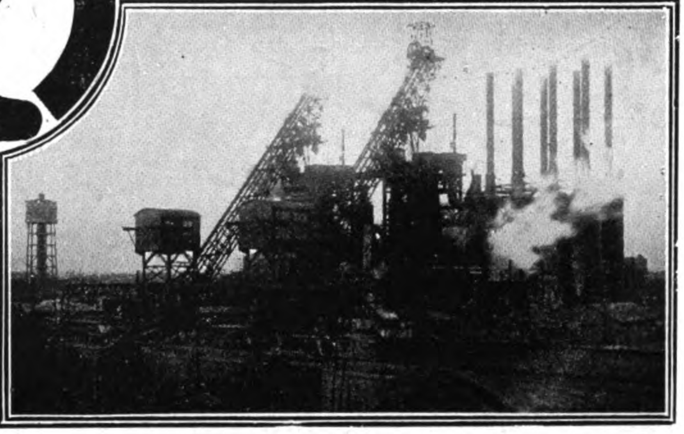

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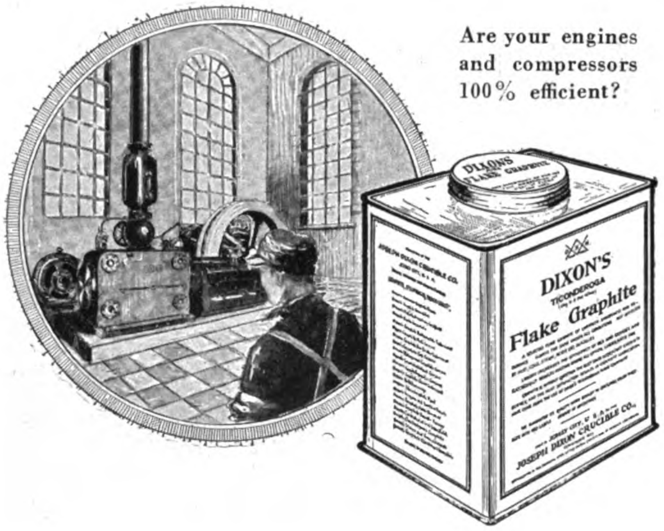

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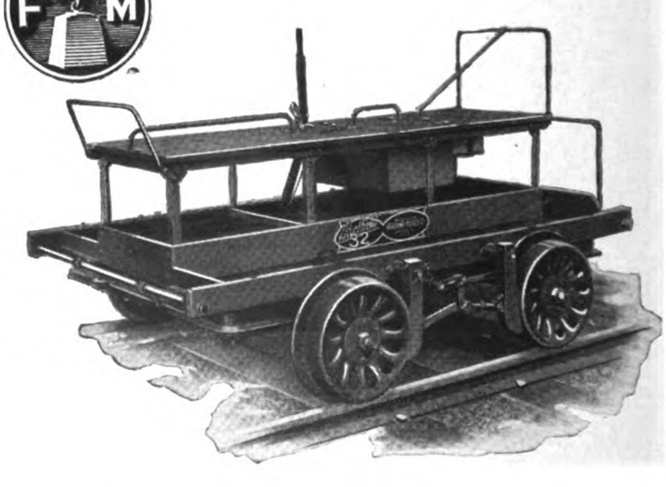

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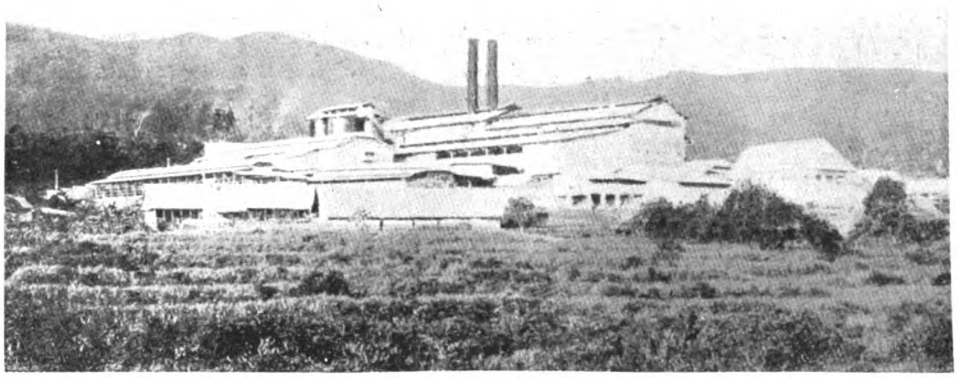

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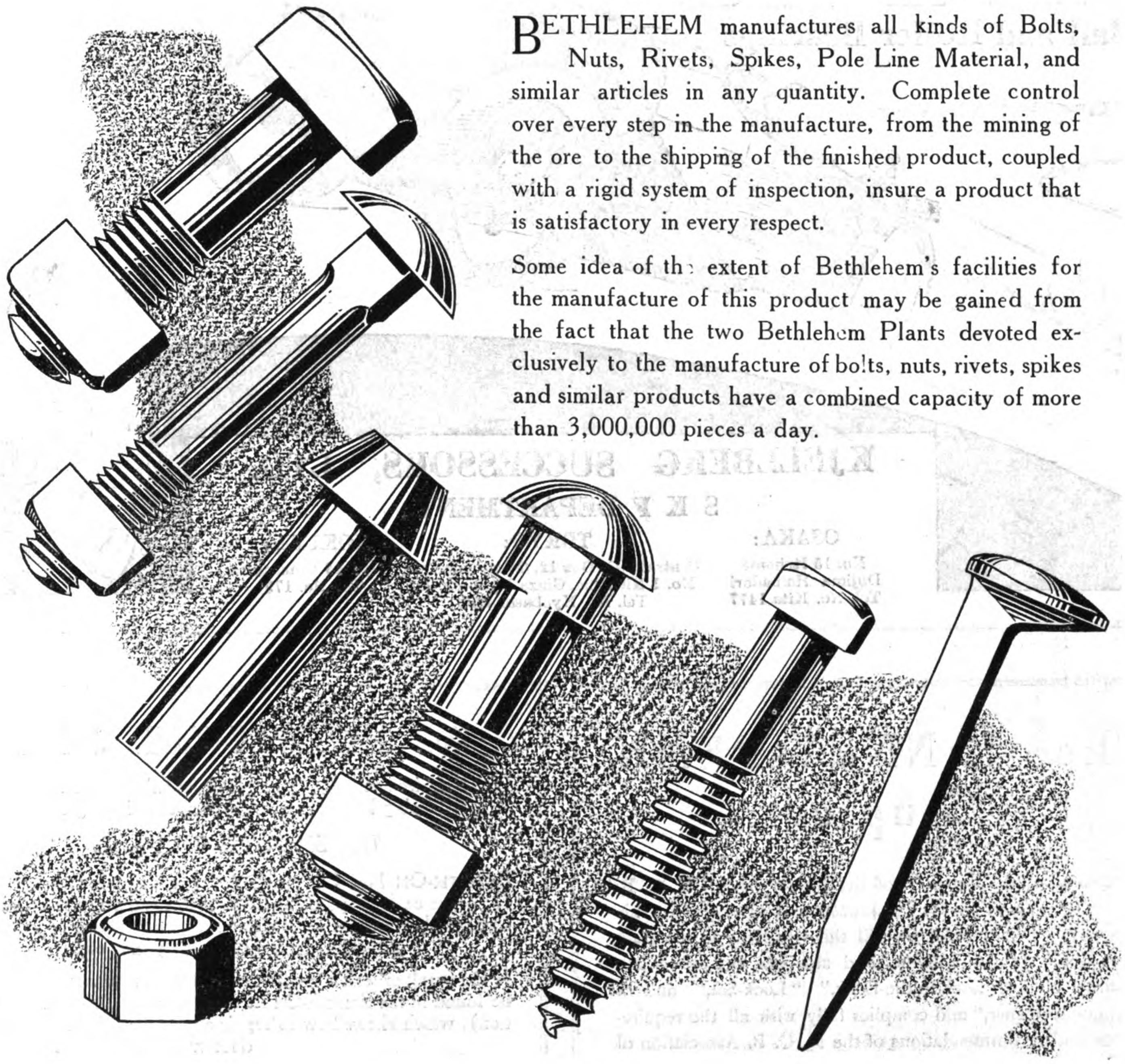

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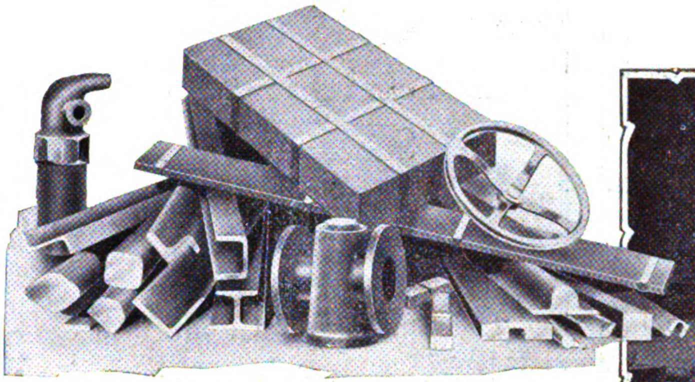

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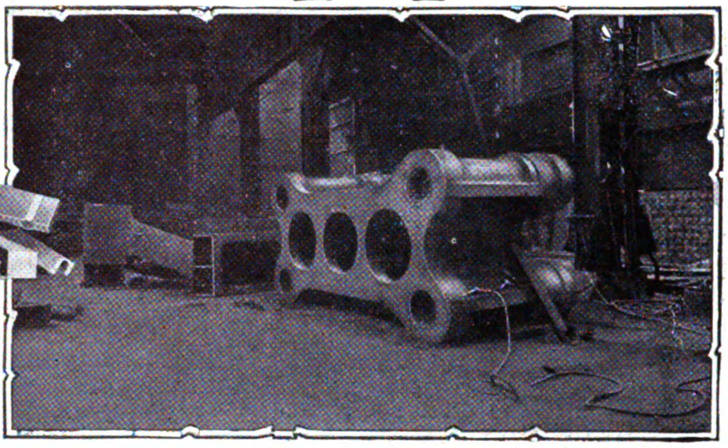

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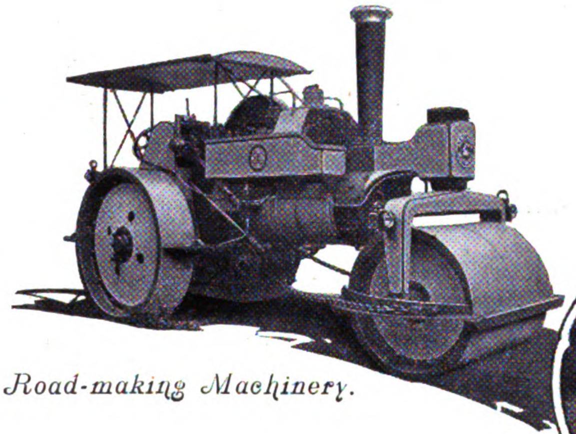

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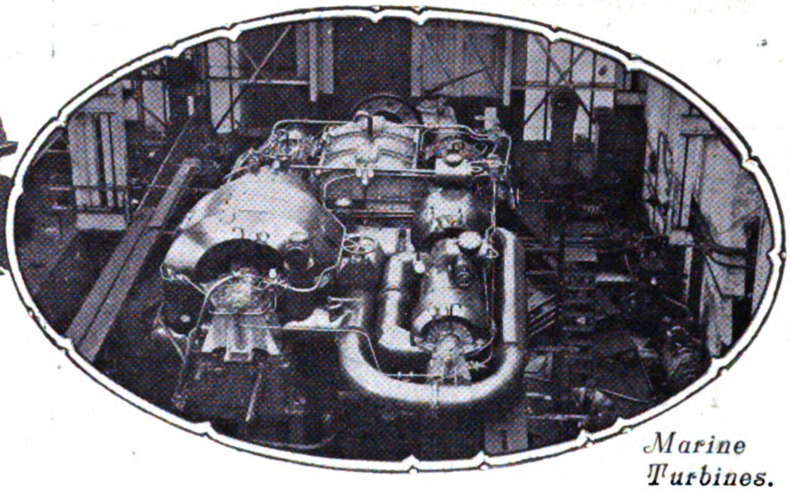

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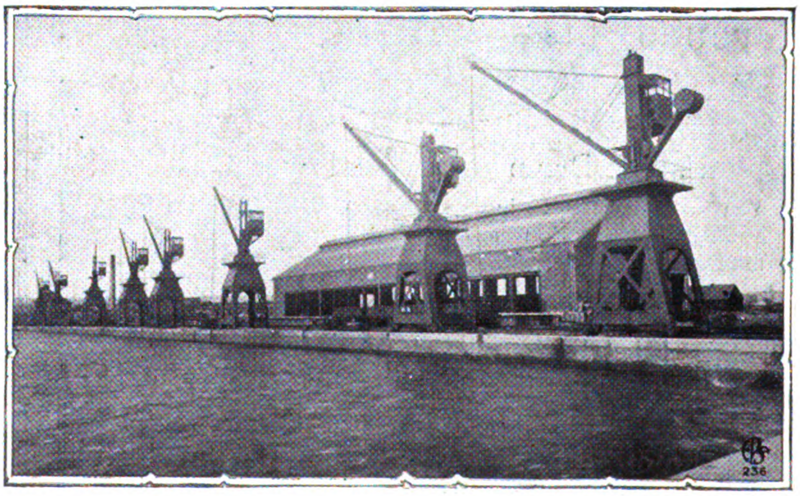

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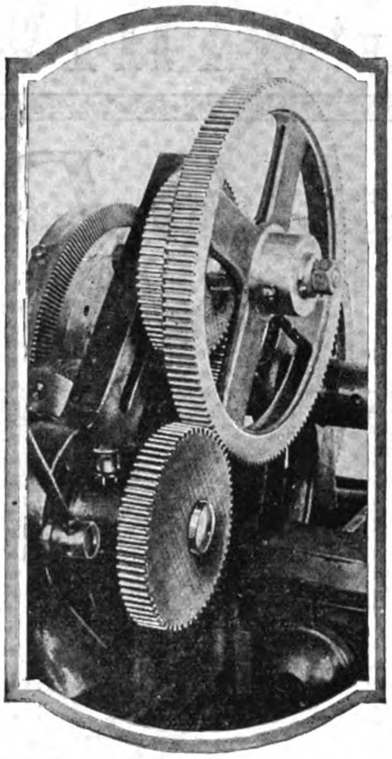

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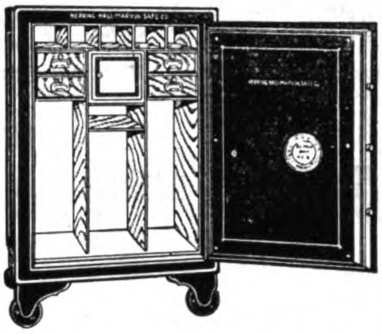

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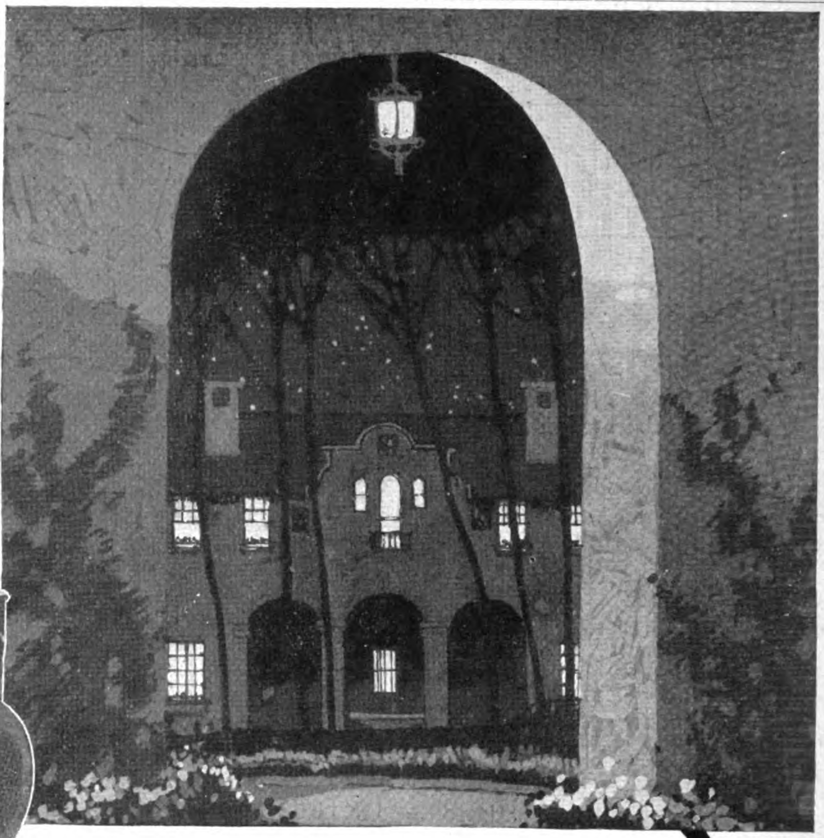

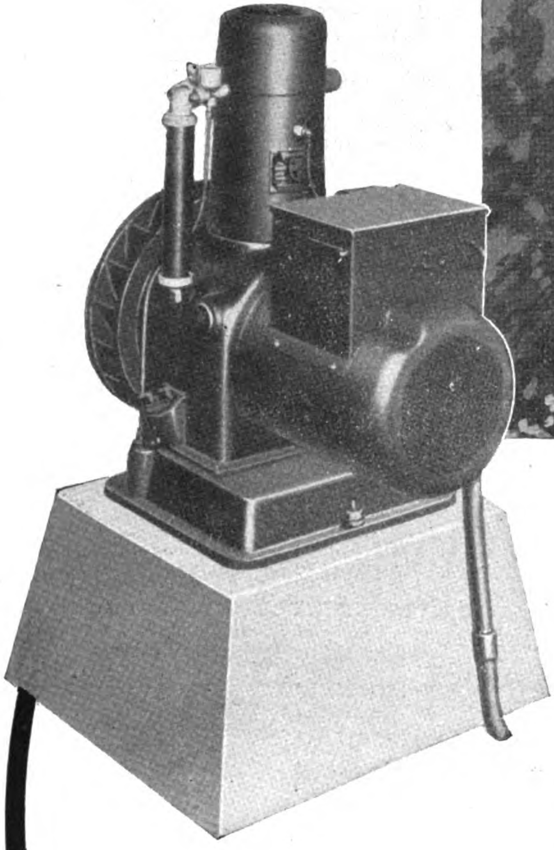

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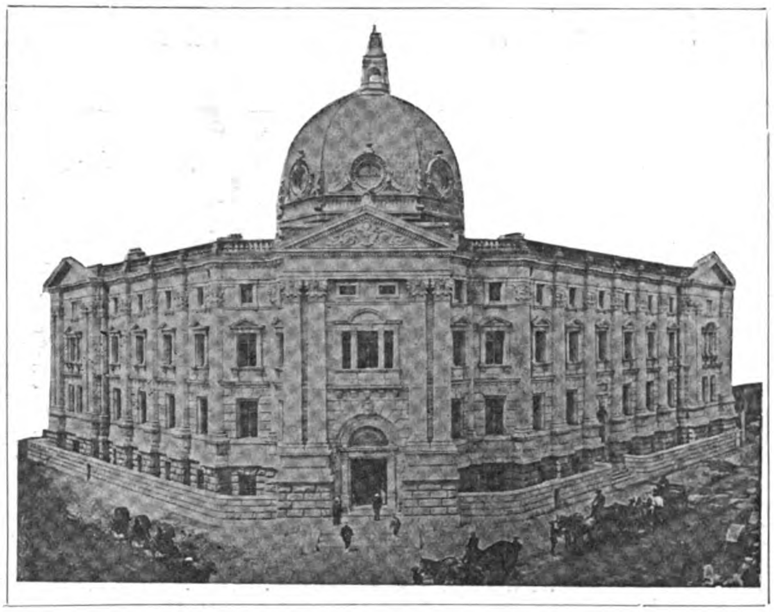

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